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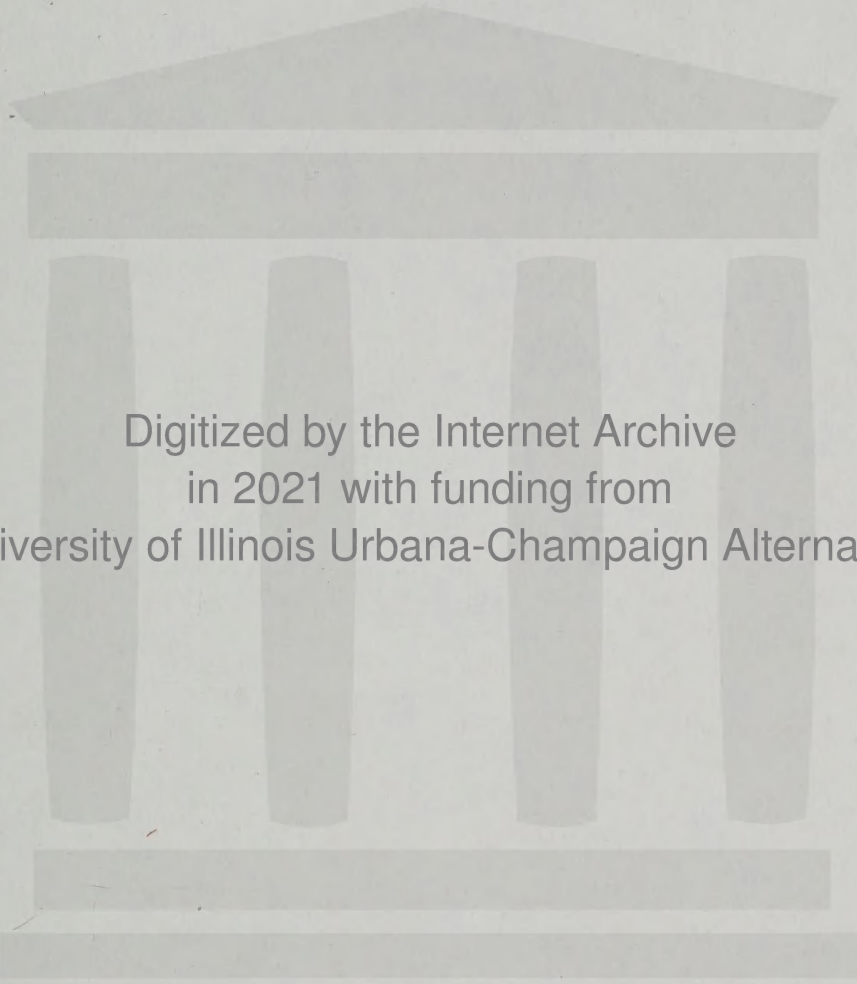
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ENTOMOLOGY

Vol. I, No. 2, pp. 153-198.

October, 1966

CATALOGUE OF THE EPHYDRIDAE, WITH
BIBLIOGRAPHY AND DESCRIPTION
OF NEW SPECIES.

BY
BURLE J. JONES

SACRAMENTO
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By BURLE J. JONES.

The present paper represents part of the scientific results of the study of the mosquito problem near Burlingame. One of the flies described herein was the most conspicuous inhabitant of many of the mosquito-infested pools. Three species of this family have been hitherto credited to California; ten others are now identified in the University collection, of which four are new.

NEW SPECIES OF CALIFORNIA EPHYDRIDAE.

Notophila varia, n. sp., ♂ and ♀.—The lighter specimens of this species are similar to *N. bellula* Williston, from which they can be distinguished by the brown vitta of the pronotum, the smaller size, and usually the lighter color of the antennæ. The brown spots on the upper part of the mesopleuræ seem also to be lacking here.

Varying from black to dull brown; front yellowish brown, with sometimes a trace of a broad, darker-brown stripe from the orbits on either side at the vertex to the lower edge of the front. The narrow orbits gray. Antennæ yellow, rarely reddish yellow, the upper part of the second and third joints and sometimes the tip of the third joint brownish or blackish.

Face and cheeks yellowish, often grayish directly beneath the eyes. Palpi light yellow; all of the femora except the knees, the lower part of the pleuræ, and the abdomen with close grayish pubescence. In most specimens a black or dark-brown cloud extends from the lower part of the pleuræ on each side upward across the shoulders, thence backward diagonally across the thorax, meeting at the center above, thus leaving a triangular light-brown spot on the pronotum. A reddish-brown vitta crosses this triangular spot from the front backwards, disappearing in the darker cloud behind. The dark color is usually slightly dispersed or entirely wanting on the scutellum; occasionally it crosses the center of the thorax diagonally or is otherwise irregular. Abdomen hoary like the femora, with brownish spots irregularly arranged on the anterior part of each segment, generally leaving the lateral border and a median line above grayish. Tips of femora, upper part of front tibiæ, middle of hind tibiæ and the tarsi, except their tips, yellow; lower part of front tibiæ and their tarsi blackish. Tips of all the tarsi slightly blackish. Wings uniformly a trifle brownish; halteres pale yellow. Face falling off considerably beneath the antennæ for this genus, with a slight median ridge above. Face narrow; entire body slender. Pattern of thoracic macrochætæ and venation of wings normal. Length, 3 to 3.25 mm. Middle and Southern California.

Parydra aurata, n. sp., ♂ and ♀.—Very similar to *Parydra bituberculata*, but differs fundamentally in the absence of the conical warts of the scutellum, also in the absence of brownish dusting on the face, in the lighter color of the antennæ, and the possession of uniform golden pubescence. Entire insect clothed with golden-yellow pubescence, under which it is black, more or less shining, and sometimes with a steel-blue reflection on the abdomen. Epistoma more densely pubescence toward the oral margin; antennæ brown or brownish yellow; tibiæ reddish yellow, sometimes distinctly brownish in the center; tarsi reddish-yellow, last joint brown or black. The characteristic bristle on each side of the face long and slender; a distinct impression above and toward the center of the face from this. Orbits and cheeks broad; clypeus very prominent; epistoma with two broad, very flat transverse ridges crossing the center above the clypeus (these are some-

times almost indistinguishable). Antennal arista long and slender, base pubescent, bare toward the tip. Vittæ of the thorax almost obsolete; the four characteristic rows of thoracic hairs slender, black, strongly reclinate. Wings brown, veins brownish black; a hyaline spot at each side of the broad brownish band of the cross veins, a fifth spot at the base of the marginal cell; second segment of the costa nearly twice as long as the third. Second longitudinal vein without appendage; third and fourth longitudinals with a slight divergence at the tips; fifth longitudinal scarcely attaining the margin of the wing. Length, 3.5 to 4 mm. San Francisco, California.

Ephydra millbrae, n. sp., ♂ and ♀.—Front bronze bluish green with sparse grayish pubescence, epistoma shading from a dark brown above to a light chestnut brown at the oral margin, sides of the face beneath brownish pruinose; antennæ dark brown, first segment lighter; proboscis black above, yellow at apex; palpi light brown; orbits purplish blue immediately beneath and behind the eyes. Thorax from the lateral margins above marked with alternating vittæ, five of blue and four of green, iridescent and sometimes indistinct; body beneath light green, with very fine grayish pubescence; abdomen green, slightly bronzed above; general color of the legs brownish green, trochanters lighter, second pair with a decided yellowish pubescence; upper half of the tibiæ light, with a row of orange yellow hairs on the upper half behind; knees yellowish; wings hyaline, halteres lemon yellow. Front sparsely clothed with short bristles, regularly arranged; ocellar protuberance considerably raised, a pair of stout macrochætæ midway between the lower and two upper ocelli, a lateral row of 2 to 3 fine hairs in the center of the ocellar triangle; a slight depression below the lowest ocellus. Epistoma densely pruinose, a row of bristles on the upper half in front, converging with the oral margins laterally; the entire epistoma clothed sparsely with short hairs, a row of slight bristles fringing the oral margin. Second joint of antennæ with numerous fine hairs, third joint destitute of a lateral pile. Sides of the thorax with only two stout macrochætæ. Veins of wings yellowish at base, darker toward the apices. Pattern of the thoracic macrochætæ above showing distinctly the

generic arrangement as given by Professor Becker in his monograph of this family, *Berliner entomologische Zeitschrift*, 1896, Tafel vii, Fig. 19 (reproduced here in Fig. 105, *b*). The two hairs at the center of the field posterior are so small, however, that they might be overlooked in a casual examination. (Fig. 105.) Length, 3.75 to 4 mm.

Egg.—White obovate, somewhat irregular in outline, without definite markings; clothed with hairs about the smaller end, usually sparsely; attached by the larger ends to floating bits of vegetation or puparia. (Fig. 102.)

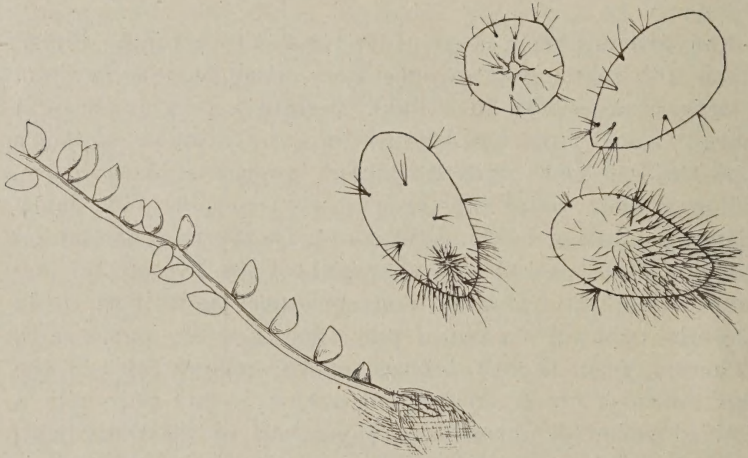


FIG. 102. Eggs of *Ephedra millbrae*.

Larva.—Length, 10 to 12 mm. with the anal siphon and its two tubes extended. Length of siphon, 3.5 mm. Densely and uniformly pubescent, excepting a number of small, very dense clusters of black hairs irregularly arranged on the last six segments, dorsad. Abdominal segments with eight pairs of false legs, non-articulated, ventral exterior end of each with two rows of transverse, curved hooks; all but last pair with first row containing four hooks, second five; behind these are three or four irregularly arranged. Each leg of the last pair bears thirteen claws in three irregular rows, the first two with three claws each and the third with seven smaller ones. Mouth parts composed chiefly of a pair of large median or foot hooks, provided with smaller, hook-like processes on the ventral sur-

face. Antennæ rudimentary, with first lobe comparatively long, second and third short. First segment back of the head with a pair of fan-like spiracles or gills; the number of branches varies from three in the young larva to seven in the adult, directly connected with the anal siphon by the tracheal sys-



FIG. 103. Larva of *Ephydra millbræ*.

tem; siphon tapering, semi-transparent. When feeding, the larva draws the food in by a process of invagination in which the mouth parts are folded back into the head. The larva resembles in some respects that of *E. californica* Pack., but differs in the number of hooks on the abdominal tubercles and



FIG. 104. Pupa of *Ephydra millbræ*.

in the form and size of the anal siphon and length of its accessory branches.

The puparium differs from that of *E. halophila* most noticeably in size, and from *E. gracilis* in the length of the anal siphon, which is much longer in the latter species; it is also much larger than *E. gracilis*. (Fig. 103.)

Pupa.—Puparium brownish black; length, about 12 mm. Seventh pair of legs small. Attached by last abdominal seg-

ment, anterior and extends into water, anal siphon protrudes. Pupa (young) white, naked; mouth parts pressed to the breast, indistinguishable; legs folded along the abdomen, head high between the eyes; wings reach to tarsi of second pair of legs. (Fig. 104.)

Note.—These flies have become very abundant along the southwest shore of San Francisco Bay between the small towns of San Mateo and San Bruno, the center of the colony seeming to be about Millbrae, where the floating puparia and adults

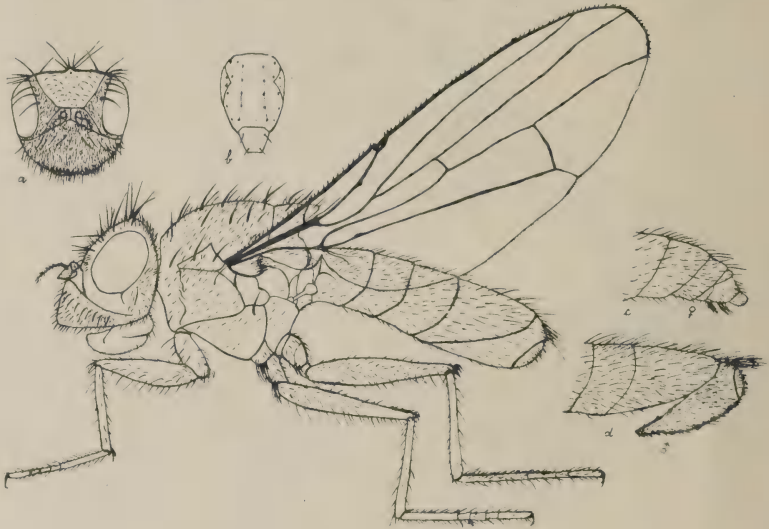


FIG. 105. *Ephedra millbrae*.

a. Head from above. b. Thorax from above, showing position of spines. c. End of abdomen of female. d. End of abdomen of male.

often cover the entire surface of the small salt-water ponds. Like mosquitoes, they seem unable to breed in water affected by the tide, but prefer the smaller pools that are practically without motion. The salinity of these marshes, owing to gradual evaporation during the summer and autumn months, often becomes much greater than that of the bay itself. I have found the flies living in ponds where the salinity was as high as 4.2 per cent, being almost one per cent higher than that of the average sea water. The migratory propensities do not seem to be very great and the immense colonies move about from pond to pond only as compelled by the absolute drying up of their habitat. The length of the life cycle is about the

same as that of the salt-marsh mosquitoes, which are often found in the same ponds. The adult flies abstract their nourishment from the surface of the water in which their larvæ live. They are especially fond of decaying animal matter, and will collect in swarms on water containing dead crabs or other animal bodies. The puparia are fastened in clusters to floating bits of vegetation and some even to the anal siphons of others. The adults crawl freely about over these floating puparia and lay their eggs upon them. These clusters of flies and puparia are shown in Plate I.

The puparia are very susceptible to the attacks of Chalcid parasites, and furnish an excellent breeding ground for them. From an aquarium in which I have bred out about seventy Ephydrids, seven of these Chalcid flies have emerged from the pupæ.

Ephydra cinerea, n. sp., ♂ and ♀.—Related to *E. hians* Say, but differs in the vittæ of the thorax, the green of the front and the very light color of the lower part of the legs. Entire insect densely cinereous pruinose, giving it a gray appearance seldom seen in members of this genus. Front brassy green, only slightly shining and densely pruinose; ocelli light orange yellow, ocellar triangle with dense fulvous pruinosity; third antennal joint also fulvous, almost umber; eyes spotted with black and deep orange yellow in varying proportions. Thorax above with three broad vittæ, varying from olivaceous at the margins to brassy green in the center; these stripes sometimes merge into an olivaceous patch with silky luster on the back of the mesothorax, usually obsolete on the scutellum. Abdomen usually concolorous, sometimes becoming yellowish toward the tip, with purplish bronze reflection, which is invisible except when the dense grayish pruinosity is rubbed off. Joints of trochanters, knees, tibiæ, and tarsi, except last joint, pale honey yellow densely clothed with grayish white pubescence; last joint of tarsi concolorous with body or slightly darker. A pair of strong macrochaetæ, as strong as the four outwardly directed above each eye, just outside the ocellar triangle at the center of its sides; a very small, erect bristle just above the lowest ocellus; another, slightly larger, directly above this at the center of the triangle; a slightly longer pair barely inside the upper ocelli, and two more pairs directly

beyond these back of the vertex. Front very sparsely clothed with short erect hairs. Second antennal joint beset with short bristles; third joint without lateral pile; arista densely pubescent at the base with longer hairs, mostly above, toward the tip and last one fourth bare. Epistoma considerably protruding, strongly arched above, a row of five to six strong lateral bristles bordering it above on each side, usually with a smaller bristle between each two of the larger ones; another row of strong bristles about the oral margin. Thoracic pattern of macrochætæ normal above; pleuræ with a row of five to six strong bristles at the base of the wings, anterior portion usually beset with short hairs, a strong macrochæta directly above the intermediate coxæ. All of the macrochætæ and hairs black. Claws unusually long and straight. Wings grayish hyaline; veins light yellow at the base, darkening toward the apices; costa beset with short, stout hairs; unusually short, stout spines occurring at regular intervals to between the third and fourth longitudinals. Halteres pale yellow, almost stramineous. Length, 4.5 to 5 mm. Southern California.

EPHYDRIDAE OF THE UNIVERSITY COLLECTION.

Besides the species described above as new, I find the following in the collection of the University of California, not heretofore known to occur in this region:

Notiphila virgata Coquillett. The general color is much lighter than the type, and the vittæ of the thorax are brown rather than black. The pattern of these vittæ and the correspondence of the markings to the type leave no doubt as to its identity. Bakersfield, California.

Notiphila scalaris Löw. Though averaging about one fourth mm. larger than the type described by Professor Löw from the Middle States, the specimens here correspond very closely in color and markings. Southern California.

Hydrellia seapularis Löw. This is very similar to the type in many cases, specimens varying somewhat. Some have a whitish dot above the antennæ, and in others the markings of the legs vary slightly. A few specimens, which I regard



PLATE I. Breeding places of *Ephydra millbrae*.

as a variety of *H. scapularis*, have the face decidedly whitish instead of dark ochraceous as in the type; they are, however, identical in other respects. San Francisco and Rivera, California.

Parydra appendiculata Löw. Apparently identical with the type. Berkeley.

Scatophila hamifera Becker. Although representatives of this genus have not before been found in this country, there seems to be no doubt but that the specimens before me belong here. The macrochaetal pattern of the thorax, the larger opening of the mouth, the sparse hairing of the face, and the fact that the costal vein ends at the third longitudinal point unmistakably toward *Scatophila*. The coloration of the various parts, the peculiar color pattern of the thorax above, as illustrated by Professor Becker (*Berl. Ent. Zeit.*, Vol. XLI, Taf. V, Fig. 11) and the number and position of the wing spots, mark our specimens as identical with the Norwegian *Scatophila hamifera*. Alameda, California.

Caenia bisetosa Coquillett. Redlands, California.

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CATALOGUE AND SYNOPSES.

In giving a synopsis of this family whose members have such a wide geographical distribution, it is often a considerable task to bring the genera and species of the various authors into their proper relation to each other. The pattern of the thoracic macrochaetae has been most constantly and consistently used by the German systematists as a distinguishing character and has reached its perfection in the slightly conventionalized drawings used by Professor Becker in his monograph of the family in the *Berliner Entomologische Zeitschrift* for 1896, in which many of the genera are very briefly and concisely separated by this method. The fact that it has been largely overlooked by many English and American writers makes it quite difficult to define the generic limits of this family which is so well represented in both Europe and America, and also renders uncertain to those not familiar with the specimens the exact relation of a new genus to those already established, not

to mention the difficulty of effecting a compromise between the German and American synopses.

A genus not included here was described by Marquart (38M411) under the name *Blepharitarsis* with a type species *ornatus*, which was figured in *Dipteres* (Planches Vol.), taf. 34, fig. 5. There was a decided discrepancy, however, between the description and the figure, and the genus was left open to question in the later works of Löw, von Roder, and Becker, and will probably never be settled without reference to the original type which was found in Africa and was in the cabinet of M. Viard when seen by Macquart. If there is a distinctive mark of this genus at present available it is probably the long bristles of the hind tarsi.

Another genus, *Pegophila*, was described by Rondani (56R129) with a type species *meridionalis*, but it differs from *Notiphila* only in the possession of a somewhat shorter second longitudinal vein, and Professor Becker does not regard this as of generic value.

A subfamily, *Lipochaetinae*, was established by Coquillett (96C220) with a single genus and species, *Lipochaeta slossonae*, to accommodate some specimens taken in Florida. The following year this insect was relegated to the family *Agromyzidae*, subfamily *Ochthiphilinae*, by Professor Williston (97W7). Mr. Townsend, in describing his species *texensis*, states that it belongs to the genus *Lipochaeta*, but differs from *slossonae* in that "the head is even broader than the thorax, clypeus projects fully the length of the face, front almost as wide but usually narrower than the oral opening, scutellum one third to one half as long as thorax, claws slender, a little elongate but not large or stout. The third and fourth veins converge toward their tip, but not strongly so." Every one of these characters, except the last, are given by Coquillett as generic and not specific, and every one differs from Mr. Townsend's species. Suppose this insect belongs to the genus *Lipochaeta*, even though the description makes this impossible, then the only specific difference we have is the following:

"The third and fourth veins strongly converging toward their tips.....*slossonae* Coq.

"The third and fourth veins converge toward their tips, but not strongly so.....*texensis* Towns."

In a family where so many discrepancies already exist I think we may be pardoned for not accepting one so marked as this.

The exact limits of this family and of several others that rank under the general terms of Calyptrate and Acalyptrate Muscidae, are certainly becoming very indefinite as new genera and species are added, and it is to be hoped by students of Dipterology that some authority will revise these at an early date and that when certainly defined descriptions of both new and old forms be published, always under the name of the family to which they belong rather than the more general term, under which many of them may be overlooked in giving the synopsis of a single family.

KEY TO SUBFAMILIES.

1. Discoidal and hind basal cells united, anal cell lacking; auxiliary vein uniting at its extremity with the first longitudinal; third antennal joint more or less flat, not rounded..... 2
 Discoidal and hind basal cells distinct, anal cell present; auxiliary vein separate from the first longitudinal throughout; third antennal segment rounded..... **Canacinae**
2. Second joint of the antennae unguiculated, or at least outer side of middle tibiae with a few strong bristles.... **Notiphilinae**
 Second antennal joint not unguiculated, outer side of middle tibiae without bristles..... 3
3. Oral opening small, eyes with distinct hairing, seldom with indistinct hairing..... **Hydrellinae**
 Oral opening large, eyes without visible hairing.... **Ephydrinae**

KEYS TO GENERA.

Subfamily NOTIPHILINAE.

1. Second joint of antennae with short, spinous bristle at the anterior upper end..... 2
 Second joint of antennae without spinous bristles 17
2. Costal vein reaches to tip of third longitudinal..... 3
 Costal vein reaches to tip of fourth longitudinal..... 4
 Costal vein reaches beyond fourth longitudinal.....
 **Ptilomyia** Coquillett
3. Tip of male abdomen with elongated bristles.. **Dichaeta** Meigen
 Tip of male abdomen without elongated bristles.. **Notiphila** Fallen
4. Head with deep concavity at base of antennae.....
 **Parephydra** Coquillett
 Head without deep concavity at base of antennae..... 5
5. Abdomen broad, flat..... **Discomyza** Meigen
 Abdomen not broad..... 6

6. Third joint of antennæ lenticular.....**Discocerina** Macquart
Third joint of antennæ not noticeably lenticular..... 7
7. Upper side of intermediate tibiæ with a few long bristles..... 8
Upper side of intermediate tibiæ without long bristles..... 9
8. Wings with a costal spine, posterior transverse vein perpendicular, legs not prolonged, clypeus prominent..**Paralimna** Löw
Wings without costal spine, posterior transverse vein oblique, legs prolonged, clypeus hardly showing..**Corythophora** Löw
9. Antennal arista naked.....**Gymnopa** Fallen
Antennal arista not naked..... 10
10. Abdomen sharply edged, first and fifth segments greatly shortened in both sexes.....**Trimerina** Macquart
Abdomen not sharply edged, fifth segment not noticeably shortened, or shortened only in the males..... 11
11. Upper part of face flat, not carinate.....**Psilopa** Fallen
Upper part of face more or less carinate..... 12
12. First and fifth abdominal segments shortened in the males.... 13
All abdominal segments distinct in both sexes..... 14
13. Präscutellar bristle wanting, only one sternopleural bristle....
.....**Hecamede** Haliday
Two präscutellar bristles, two sternopleural bristles.....
.....**Allotrichoma** Becker
14. Clypeus prominent beneath the oral margin..**Athyroglossa** Löw
Clypeus hidden or projecting but little beyond the oral margin.. 15
15. Epistoma arched, with only one lateral bristle.....
.....**Ephygrobia** Schiner
Epistoma either slightly concave or kielied above, more than one lateral bristle..... 16
16. Thorax with one supraalar bristle.....**Clasiopa** Stenhammar
Thorax with three supraalar bristles.....**Paratissa** Coquillett
17. Wings normal..... 18
Wings small or rudimentary..... 24
18. Hind femora thickened and first joint of tarsi very long.....
.....**Amalopteryx** Eaton
Hind femora not greatly thickened and first joint of tarsi normal 19
19. Abdomen decidedly arched, pointed, first longitudinal vein long, arched at extremity.....**Cnestrum** Becker
Abdomen not decidedly arched or pointed, first longitudinal vein normal..... 20
20. Eyes haired, costal vein with two bristles at junction of first longitudinal.....**Atissa** Haliday
Eyes naked, costa without spines..... 21
21. Epistoma with a nose-like ridge above.....**Ilythea** Haliday
Epistoma arched above, or without nose-like protuberance..... 22
22. Epistoma decidedly arched.....**Philotelma** Becker
Epistoma not decidedly arched..... 23
23. One small fronto-orbital bristle on each side, tibiæ without bristles, oral opening small.....**Beckeriella** Williston
Two fronto-orbitals on each side, all of the tibiæ with a row of bristle-like hairs on the outer side, oral opening of moderate size.....**Gastrops** Williston
24. Wings short, scaly, halteres small.....**Apetaenus** Eaton
Wings rudimentary, clothed with hairs, halteres of usual size....
.....**Chamaebosca** Speiser

Subfamily HYDRELLINAE.

- | | |
|---|-----------------------------|
| 1. Eyes thickly pubescent..... | 2 |
| Eyes sparsely pubescent or bare..... | 4 |
| 2. Back of thorax without evident machrochaetae, antennal arista
bare or feebly pubescent..... | <i>Glenanthe</i> Haliday |
| Back of thorax with distinct dorso-central machrochaetae..... | 3 |
| 3. Face convex..... | <i>Hydrellia</i> Rob.-Desv. |
| Face slightly concave..... | <i>Nostima</i> Coquillett |
| 4. Costal vein extending to third longitudinal..... | <i>Axysta</i> Haliday |
| Costal vein extending to fourth longitudinal..... | 5 |
| 5. Thorax with three pairs of dorso-central and two noto-pleural
machrochaetae, sides of face without bristles..... | <i>Philygria</i> Stenhammar |
| Thorax with only one pair of dorso-central machrochaetae and
always one noto-pleural machrochaeta, sides of face with
bristles..... | <i>Hyadina</i> Haliday |

Subfamily EPHYDRINAE.

- | | |
|--|-------------------------------|
| 1. Clypeus projecting..... | 2 |
| Clypeus hidden..... | 9 |
| 2. Oral opening small..... | 3 |
| Oral opening large..... | 7 |
| 3. Front femora much thickened, first posterior cell narrowed at the
border of the wing..... | <i>Ochthera</i> Latreille |
| Front femora moderately thickened, third and fourth veins
parallel..... | <i>Ochtheroidea</i> Williston |
| Front femora not thickened..... | 4 |
| 4. Hind legs long, extremity of proboscis bent back to form a hook
..... | <i>Ectropa</i> Schiner |
| Hind legs not lengthened, extremity of proboscis not hook-shaped | 5 |
| 5. Anterior part of mesonotum without bristles.... | <i>Pelina</i> Haliday |
| Anterior part of mesonotum with bristles..... | 6 |
| 6. Third joint of antennae with an obtuse carina above..... | <i>Lytogaster</i> Becker |
| Third joint of antennae nearly round, large..... | <i>Domina</i> Hutton |
| 7. Costal vein reaches to third longitudinal.... | <i>Brachydeutera</i> Löw |
| Costal vein reaches to fourth longitudinal..... | 8 |
| 8. Oral margin with several erect bristles laterally, auxiliary vein
distinct from the first longitudinal throughout, thorax with
five distinct dorso-central machrochaetae.... | <i>Halmopota</i> Haliday |
| Oral margin without bristles laterally, auxiliary vein coalescing
with the first longitudinal except at its proximal end, thorax
with only two to three dorso-central machrochaetae..... | <i>Parydra</i> Haliday |
| 9. Claws almost straight, pulvilli indistinct..... | <i>Ephydra</i> Fallen |
| Claws curved, pulvilli distinct..... | 10 |
| 10. Costal vein reaches to third longitudinal..... | 11 |
| Costal vein reaches to fourth longitudinal..... | 12 |
| 11. Thorax with only a pair of humeral machrochaetae in front.... | <i>Scatophila</i> Becker |
| Thorax with four rows of bristles extending to the anterior part
..... | <i>Pelomyia</i> Williston |

12. Antennal arista bare, first antennal joint forming an angle with the second and third.....**Teichomyza** Macquart
Antennal arista not bare, segments not forming an angle..... 13
13. Antennal arista pubescent.....**Scatella** Rob.-Desvoidy
Antennal arista pectinated..... 14
14. Femora not incrassated.....**Caenia** Rob.-Desvoidy
Femora slightly incrassated, metathorax elliptical, enormously developed, covering whole abdomen, legs short, stout, tibiae curved, wings concealed beneath metathorax...**Nomba** Walker

Subfamily CANACENAE.

1. Hind basal and anal cells distinct, auxiliary vein separate from first longitudinal.....**Canace** Haliday

NOTIPHILINAE.

PTILOMYIA Coquillett. Type *enigma*.

enigma Coq. 00C262, 00S309, 05A624. Porto Rico.

DICHAETA Meigen. Type *caudata*.

NORTH AMERICAN SPECIES.

1. Last abdominal segment comparatively short and blunt....
.....*brevicauda* Löw.
Last abdominal segment prolonged into a conical point or tubercle 2
2. Mesonotum with three indistinct brown vittae.....
.....*furcata* Coquillett.
Mesonotum with one brownish and four whitish gray vittae
.....*caudata* Fallen.
brevicauda Lw. 62L133, 780S200, 95J338, 96B268,
05A623. Middle States, New Jersey, Florida.
caudata Fall. 62L133, 780S200, 96B268, 02S88, 05A623.
Middle States.
furcata Coq. 02C182, 02S263. Florida.

EUROPEAN SPECIES.

2. *brevicauda* Lw. 60L5, 64S236, 96B103. Silesia.
2. *caudata* Fall. 30M62, 44S194, 53W251, 56R129, 60L5,
64S236, 96B103, *Notiphila* 23F8, 38Z717, 46Z1853. Whole
of Europe.
tibialis Brule. 32M318, 96B104. Europe.

NOTIPHILA Fallen.

NORTH AMERICAN SPECIES.

1. Greater part of antennae yellow..... 2
Third joint of antennae yellowish at base...*decorata* Williston.
Third joint of antennae reddish or reddish yellow at base.... 3
Greater part of antennae reddish..... 6
Antennae black throughout, or at least with third joint
brownish..... 7

NORTH AMERICAN SPECIES—Continued.

2. Pronotum with a median brownish vitta.....*varia* n. sp.
Pronotum without such vitta.....*virgata* Coquillett.
3. Palpi blackish.....*pulchrifrons* Löw.
Palpi yellowish..... 4
4. Upper side of thorax with broad brown lateral stripe.....
.....*vittata* Löw.
Upper side of thorax without such stripe..... 5
5. Abdomen with irregular brownish semifasciae, each formed
by two spots.....*carinata* Löw.
Abdomen with two brown spots on each of the intermediate
segments.....*unicolor* Löw.
Abdomen dull, but without brown spots.....*avia* Löw.
6. Palpi blackish.....*solita* Walker.
Palpi reddish yellow.....*erythroceræ* Löw.
Palpi light yellow.....*bellula* Williston.
7. Palpi yellowish.....*bella* Löw.
Palpi blackish..... 8
8. Front with two black stripes separated by the ocellar triangle
.....*decoris* Williston.
Front without such stripes..... 9
9. Hind metatarsi with a strong black bristle on the under side
.....*macrochaeta* Löw.
Hind metatarsi without such bristles..... 10
10. Wings slightly notched at the end of the first longitudinal....
.....*producta* Walker.
Wings without such notches..... 11
11. Chest with two gray stripes.....*transversa* Walker.
Chest without such stripes..... 12
12. Upper side of thorax with five fine brown lines.....*scalaris* Löw.
Upper side of thorax with fewer or no vittae.....
.....*quadrisetosa* Thomson.
 argentata. See **Brachydeutera**.
 avia Lw. 78L193, 78OS200, 78K244, 96B268, 05A623.
 Hudson Bay Territory.
 bella Lw. 62L133, 78OS200, 96B269, 05A623. Middle
 States.
 bellula Will. 96W390, 96S291, 05A623. St. Vincent.
 brevicornis. See **Hyadina nitida**.
 carinata Lw. 62L137, 78OS200, 96B269, 05A623. Middle
 States, New Jersey.
 decorata Will. 96W389, 96S291, 05A623. St. Vincent.
 decoris Will. 93W258, 93S231, 05A623. Panamint Valley
 (California).
 erythroceræ Lw. 78L194, 78K244, 78OS201, 96B269,
 05A623. Cuba.
 guttata. See **Hyadina**.
 guttata var. *brevicornis*. See **Hyadina nitida**.
 macrochaeta Lw. 78L192, 78OS200, 78K244, 96B269,
 05A623. Texas.
 producta Walk. 49W1099, 78OS201, 96B266, 05A623.
 Hudson Bay.
 pulchrifrons Lw. 72L102, 72L84, 72R389, 78OS200,
 96B269, 97W52, 05A623. Texas.

NORTH AMERICAN SPECIES—Continued.

- quadrissetosa* Thoms. 68T594, 70V442, 78OS200, 96B271, 05A623. California.
repleta. See *Scutella*.
scalaris Lw. 62L134, 78OS200, 96B268, 05A623. Middle States, New Jersey.
solita Walk. 56W406, 78OS201, 96B266, 05A623. United States.
transversa Walk. 56W407, 78OS201, 96B266, 05A623. United States.
unicolor Lw. 62L137, 64D559, 78OS200, 96B268, 05A623. Middle States.
varia n. sp.
virgata Coq. 00C259, 00S309, 05A623. Porto Rico.
vittata Lw. 62L136, 65L134, 78OS200, 96B268, 05A623. Middle States, New Jersey.

EUROPEAN SPECIES.

- albicans*. See *Hecamedea*.
albifrons. See *Hydrellia nigricans*.
albilabris. See *Hydrellia*.
annulipes Stenh. 44S203, 60L7, 64S238, 96B113. Scandinavia, Germany, Silesia.
aquatica Beck. 96B114, 96S291. Silesia, Poland.
australis Lw. 60L7, 64S239, 96B110. Germany, Greece, Asia Minor, Italy.
cacsia. See *Hydrellia*.
caudata. See *Hydrellia*.
chalconeata. See *Clasiopa*.
chamaeleon Beck. 96B114, 96S291. Pavia.
cinerea Fall. 13F250, 23F8, 30M64, 35M521, 38Z717, 44S200, 46Z1855, 60L7, 64S239, 96B112, *Keratocera palustris* 30RD788. Europe.
compta. See *Ephygrobia*.
concolor. See *Hydrellia*.
discolor. See *Hydrellia*.
dorsata Stenh. 44S198, 60L7, 64S239, 96B113. Scandinavia, Germany, Silesia.
erythrostoma. See *Hydrellia nigripes*.
flaviceps. See *Hydrellia discolor*.
flavicornis. See *Hydrellia*.
fulviceps. See *Hydrellia*.
fusca. See *Hydrellia*.
genicula. See *Hydrellia*.
glabrata. See *Ephygrobia*.
glaucella. See *Clasiopa*.
grisea. See *Hydrellia*.
griseola. See *Hydrellia*.
guttiventris Stenh. 44S206, 46Z1860, 60L7, 64S239, 96B111. Scandinavia, Germany.
incana. See *Hydrellia ranunculi*.
incurva. See *Discomyza*.
interstincta. See *Philygria*.
laticeps. See *Hydrellia*.

EUROPEAN SPECIES—Continued.

- maculata* Stenh. 44S201, 46Z1862, 60L7, 64S239, 96B111.
Scandinavia, Germany, Silesia.
madizans. See *Trimerina nigella*.
major Stenh. 44S196, 46Z1857, 96B111. Sweden.
mutata. See *Hydrellia*.
nigrella. See *Psilopa*.
nigricauda. See *Philygria*.
nigricornis Stenh. 44S202, 60L6, 64S237, 96B109. Scandinavia, Germany, Austria.
nigripes. See *Hydrellia*.
nymphaeae. See *Hydrellia*.
obscura. See *Clasiopa*.
picta. See *Philydra*.
pilitarsis. See *Hydrellia*.
plumosa. See *Clasiopa*.
punctinervosus. See *Philygria*.
punctipennis Wied. 30W590, 96B266. Europe.
riparia Meig. 30M65, 35M522, 44S204, 60L7, 64S238, 96B112. Scandinavia, France, England, Germany, Silesia, Asia Minor.
stagnicola Stenh. 35M522, 44S197, 46Z1854, 60L6, 64S239, 96B109, *Keratocera* 30RD789. Scandinavia, Germany, Silesia.
tarsata. See *uliginosa*.
uliginosa Halid. 39H922, 60L6, 64S237, 96B109, *tarsata* 44S207. England, Scandinavia, Austria.
venusa Lw. 56L55, 60L7, 64S238, 96B112. Scandinavia, Germany, Austria, Silesia.
vittipennis. See *Philygria*.

OTHER COUNTRIES.

- albiventris* Wied. 30W589, 96B266. East Indies.
alboclavata Bigot. 88B41, 88S295, 96B272. Cape Horn.
bipunctata Lw. 62L12, 96B268. Swakop.
brasiliensis Walk. 56W408, 96B266. Brazil.
carbonaria Walk. 60W169, 65D663, 96B268. New Guinea.
chinensis Wied. 30W592, 96B266. China.
ciliata v. d. Wulp. 81W55, 81K253, 96B271. Sumatra.
costalis Walk. 56W408, 96B266. Brazil.
difficilis Wied. 30W591, 96B266. South America.
dorsopunctata Wied. 30W591, 91W215, 92S301, 96B266. East Indies.
exotica Wied. 30W590, 96B266. Montevideo.
fasciata Wied. 30W589, 96B266. East Indies.
flavilinea Walk. 60W170, 96B268. Celebes.
granifera Thoms. 68T594, 96B271. Insula Rossi.
ignobilis Lw. 62L12, 96B268. Cape of Good Hope, Swakop.
immaculata Wied. 30W592, 96B266. China.
indica Wied. 30W591, 96B266. East Indies.
insularis Grims. 01G49, 01S273. Oahu (Sandwich Islands).

OTHER COUNTRIES—Continued.

- lineosa* Walk. 60W170, 96B267. Celebes.
obscuricornis Lw. 62L12, 96B268. Swakop.
ortaloides Walk. 60W169, 64D559, 65D663, 96B268.
 Mysol.
peregrina Wied. 30W592, 96B266. China.
 2. *pulchrifrons* Will. 97W5, 97S263. Brazil.
quadrifasciata Walk. 60W170, 96B267. Celebes.
radiatula Thoms. 68T595, 70V442, 96B271. China.
sinensis Schin. 68S241, 68D374, 83K251, 96B273.
 Hongkong.
smaragdi Walk. 49W1098, 96B266. Sierra Leone.
sternalis Thoms. 68T593, 70V442, 96B271. Manila.
striata Will. 97W5, 97S265. Brazil.
triangulifera Schin. 68S241, 68D374, 96B273. South
 America.
 2. *unicolor* Walk. 60W169, 96B268. Mysol.
unilineata Walk. 60W169, 65D663, 96B268. New Guinea.

PAREPHYDRA Coquillett. Type *humilis*.
humilis Coq. 02C183, 05A626.

DISCOMYZA Meigen. Type *incurva*.

NORTH AMERICAN SPECIES.

1. Antennæ yellowish red.....*balioptera* Löw.
 Antennæ black.....*dubia* Williston.
balioptera Lw. 62L140, 78S201, 96B268, 05A624.
 Cuba.
dubia Will. 96W392, 96S290, 05A624. St. Vincent.

EUROPEAN SPECIES.

- cimiciformis* Halid. 38H124, 38G99, 88S295, 96B129.
 Germany, Ireland, East coast of Europe.
incurva Fall. 30M76, 35M529, 44S265, 60L8, 64B713.
 64D559, 82B14, 82K252, 96B129, *Psilopa* 23F6, 46Z1941,
Notiphila 64S241. Germany, North and Middle Europe,
 Britain.

OTHER COUNTRIES.

- amabilis* Kertez. 01K421, 01S272. Singapore.
obscurata Walk. 60W169, 96B267. Philippines.
pelagica Frnfl. 61F451, 96B273. Nikobara.
punctipennis v. d. Wulp. 81W56, 81K253, 96B271.
 Sumatra.
tenebrosa Walk. 60W169, 65D663, 96B267. New Guinea.

DISCOCERINA Macquart. Type *leucoprocta*.

NORTH AMERICAN SPECIES.

1. Orbit of eyes white shining.....*orbitalis* Löw. 2
 Orbit of eyes not shining, white..... 2
 2. Abdomen black, at least at base..... 3
 Abdomen not black..... 8

NORTH AMERICAN SPECIES—Continued.

3. Last segment of abdomen white or silvery gray..... 4
Last segment of abdomen not white..... 5
 4. Last segment and front angles of the two preceding segments of abdomen whitish pruinose.....*incisa* Coquillett.
White confined entirely to last segment of abdomen.....*leucoprocta* Löw.
 5. Face silvery gray with a medium black stripe. *nana* Williston.
Face uniform in color..... 6
 6. Face vaulted, oral opening very large.....*facialis* Williston.
Oral opening of moderate size..... 7
 7. Thorax black, shining through brownish dust.....*obscura* Williston.
Thorax ash gray, opaque.....*parva* Löw.
 8. Antennæ reddish yellow, third joint a little infuscated on the apical margin.....*lacteipennis* Löw.
Antennæ black, a whitish pollinose dot on the upper edge of the second joint.....*simplex* Löw.
- calceata*. See **Clasiopa**.
compta. See **Ephygrobia**.
facialis Will. 96W396, 96S290, 05A626. St. Vincent.
incisa Coq. 02C182, 02S263, 05A626. Porto Rico.
lacteipennis Lw. 62L145, 78OS201, 96B268, 05A626.
Washington (D. C.), New Jersey.
leucoprocta Lw. 61L355, 62L148, 78OS201, 96B269, 96W395, 00C261, 05A626. Maryland.
nigritella. See **Ephygrobia**.
nana Will. 96W396, 96S290, 05A626. St. Vincent.
obscura Will. 96W397, 96S290, 05A626. St. Vincent.
obscurella. See **Clasiopa**.
orbitalis Lw. 61L354, 65L91, 62L147, 78OS201, 96B369, 05A626. Washington (D. C.).
parva Lw. 62L146, 78OS201, 96B268, 00C261, 00H592, 05A626. Washington (D. C.), Florida.
pulicaria. See **Clasiopa**.
simplex Lw. 61L354, 62L147, 78OS201, 96B369, 05A626. Maryland.

PARALIMNA Löw. Type *appendiculata*.

NORTH AMERICAN SPECIES.

1. Face brownish gray.....*obscura* Williston.
Face grayish white..... 2
Face yellowish white..... 3
2. First joint of front tarsi at base and first joint of hind tarsi red.....*appendiculata* Löw.
First joint of front and hind tarsi concolorous or yellowish.....*multipunctata* Williston.
3. Thorax black, antennæ black throughout.....*decipiens* Löw.
Thorax with grayish pruinosity, third antennal joint yellow.....*nuda* Coquillett.
appendiculata Lw. 62L138, 78OS201, 95J338, 96B268, 05A624. Middle States, New Jersey.

NORTH AMERICAN SPECIES—*Continued.*

- decipiens* Lw. 78L195, 78OS201, 78K244, 96B270, 00C259,
05A624. Texas, Georgia, Florida.
multipunctata Will. 96W390, 96S291, 05A624. St. Vin-
cent.
nuda Coq. 02C182, 02S264, 05A624. Mexico.
obscura Will. 96W391, 96S291, 05A624. St. Vincent,
Porto Rico.

EUROPEAN SPECIES.

2. *appendiculata* Lw. 62L138, 96B115. Germany.

OTHER COUNTRIES.

- albonotata* Lw. 62L13, 96B268. Caffraria.
confluens Lw. 62L13, 96B268. Caffraria.
javana v. d. Wulp. 91W215, 92S302, 96B271. Java.
limbata Lw. 62L13, 96B268. Caffraria.
picta Kert. 01K423, 01S273. New Guinea.

CORYTHOPHORA Löw. Type *longipes*.

- longipes* Lw. 62L13, 96B116, 96S290. Caffraria.

GYMNOPA Fallen. Type *subsultans*.

- aenea*. See *subsultans*.
albipennis Lw. 48L14, 96B127. Germany, Messina.
nigra. See *subsultans*.
subsultans Fabr. 48L13, 56R128, 64S234, 96B127.
nigra 30M137, *aenea* 23F10, 30M137, *Ulida* 46Z2679,
arcuata 35M505, *Syrphus* 1798F304, *Mosillus arcuatus*
1809L389, *Glabrinus mororum* 56R132. Europe.

TRIMERINA Macquart. Type *Psilopa madizans* Meig.

- nigella* Meig. 60L8, 64S240, 94B117, *madizans* 35M529,
Notiphila 30M72, *Psilopa* 23F7, *nigella* 44S263. Ger-
many, North and Middle Europe.
tibialis Macq. 35M528, 96B117. Europe.

PSILOPA Fallen.

NORTH AMERICAN SPECIES.

1. Entire legs, including the coxæ, yellow....*mellipes* Coquillett. 2
Legs not entirely yellow.....
2. Thorax black anteriorly, posterior part scoriaceous.....
.....*scoriacea* Löw.
Mesonotum of thorax deep brown.....*desmata* Williston.
Mesonotum and scutellum subopaque, slightly scabrous, thinly
gray pruinose.....*similis* Coquillett.
Mesonotum and scutellum thinly yellowish dusted.....
.....*nigrimana* Williston.
Mesonotum and scutellum yellowish, usually polished.....
.....*flavida* Coquillett.
Mesonotum and scutellum gray or dusted with gray..... 3
Mesonotum and scutellum green or tinged with green..... 5
Mesonotum and scutellum black..... 7

NORTH AMERICAN SPECIES—Continued.

3. Abdomen shining steel blue.....*coeruleiventris* Löw.
Abdomen black..... 4
4. Antennæ reddish yellow.....*umbrosa* Löw.
Antennæ black.....*nigra* Williston.
5. Hypopygium white.....*nobilis* Löw.
Hypopygium not white..... 6
6. First joint of anterior tarsi white.....*pulchripes* Löw.
First joint of anterior tarsi not white.....*varipes* Coquillett.
7. Thorax finely aciculate.....*aciculata* Löw.
Thorax not finely aciculate..... 8
8. A minute blackish spot at the tip of the third vein.....
.....*nigropuncta* Williston.
No black spot at tip of third vein..... 9
9. Halteres white, petiole blackish.....*atra* Löw.
Halteres white, petiole yellowish.....*petrolei* Coquillett.
Petiole of halteres concolorous..... 10
10. Entire abdomen shining black.....*nitidula* Fallen.
Abdomen with a greenish reflection.....*atrimana* Löw.
Abdomen black, dull toward the tip.....*aenea-nigra* Löw.
aciculata Lw. 62L142, 78OS201, 96W394, 96B268, 97W4,
00C260, 05A624. Cuba.
aenea-nigra Lw. 78L196, 78K244, 78OS201, 05A624.
Texas.
atra Lw. 62L143, 78OS201, 96B268, 05A624. Middle
States.
atrimana Lw. 78L197, 78K244, 78OS201, 05A625.
Texas, New Jersey.
coeruleiventris Lw. 62L144, 78OS201, 96B268, 05A625.
Cuba.
desmata Will. 96W395, 96S291, 05A625. St. Vincent.
flavida Coq. 00C33, 00S310, 05A625. Massachusetts.
mellipes Coq. 00C260, 05A625. Porto Rico.
nigra Will. 96W393, 96S291, 05A625. St. Vincent.
nigrimana Will. 96W393, 96S296, 97W4, 00C260,
05A625. St. Vincent, Porto Rico.
nigropuncta Will. 96W393, 96S291, 05A625. St. Vin-
cent.
nitidula Fall. 13F252, 05A625, *Notiphila* 49W1089, *Ephy-*
grobia 96B266. Martin Falls (Canada).
nobilis Lw. 62L229, 72L92, 78OS201, 05A625. District of
Columbia.
petrolei Coq. 99C8, 99C&H235, 99H75, 99S240, 05A625.
California.
pulchripes Lw. 78L197, 78K244, 78OS201, 05A625.
Texas.
scoriacea Lw. 62L142, 78OS201, 96B268, 05A625. New
York, New Jersey.
similis Coq. 00C33, 00S310, 05A625. Florida, Louisiana.
umbrosa Lw. 62L143, 78OS201, 96B268, 05A625. Cuba.
varipes Coq. 00C33, 00S310, 05A625. British Columbia.

EUROPEAN SPECIES.

- apicalis*. See *Ephygrobia*.
compta. See *Ephygrobia*.
girschneri. See *Ephygrobia*.

EUROPEAN SPECIES—Continued.

- leucostoma*. See **Ephygrobia**.
nigrotaeniata Bezzi (*Diasemocera* new subgenus). 95B137,
 95S344. Italy.
madzans. See **Trimerina nigrella**.
marginella. See **Ephygrobia**.
maritima. See **Ephygrobia**.
nigrella. See **Trimerina**.
nitidula Fall. 13F252, 23F7, 44S261, 46Z1932, *Hydrellia*
Notiphila 49W1098, 60L10, 89R56, *Ephygrobia* 64S242,
 96B143. Silesia, South Russia, Sarepta. See also
Ephygrobia compta.
obscuripes. See **Ephygrobia**.
polita. See **Ephygrobia**.
roderi. See **Ephygrobia**.
tarsata. See **Ephygrobia**.

OTHER COUNTRIES.

- metallica Schin. 68S242, 97W4. Brazil.

HECAMEDE Haliday. Type *albicans*.

- abdominalis*. See *Allotrichoma*.
albicans Meig. 39H224, 53W254, 56W344, 60L13, 96B121,
Notiphila 30M65, 38Z4760, *Clasiopa globifera* 52B204.
 Coast of Europe.
aurella Strohl. 93S256, 93S321. Styria.
glauccella. See *Clasiopa*.
xanthocera. See *Clasiopa*.

ALLOTRICHOMA Becker. Type *lateralis*.

NORTH AMERICAN SPECIES.

- abdominalis Will. 97W4, 00C260, 05A624, *Hecamede*
96W398. St. Vincent.

EUROPEAN SPECIES.

- bezzi Beck. 96B123, 96S290. Italy.
filiformis Beck. 96B123, 96S290. Sarepta, Italy.
lateralis Lw. 60L13, 96B122. Italy, Sicily.
trispinum Beck. 96B124, 96S290. Silesia, Malta.

OTHER COUNTRIES.

2. abdominalis Will. 00C260. Brazil.

ATHYROGLOSSA Loëw. Type *glabra*.

NORTH AMERICAN SPECIES.

1. Tarsi white, except the last segments, which are brown.....*glaphyropus* Löw.
Tarsi not white.....
2. Wings hyaline.....*glabrata* Meigen.
Wings tinged with brown.....*nitida* Williston.
glabrata Meig. 56W254, 60L12, 64S254, 96B134, 05A625,
Notiphila 30M69. Washington.
glaphyropus Lw. 78L198, 78OS202, 78K244, 96B270,
05A626. Texas.
nitida Will. 96W397, 96S290, 00C260, 05A626. St. Vin-
cent, Porto Rico.

EUROPEAN SPECIES.

- glabra* Meig. 30M69, 53W254, 60L12, 64S245, 96B134.
Germany, Silesia.
nudiuscula Lw. 73L307, 73R426, 73L50, 96B134.
Hungary, Kasan.
ordinata Beck. 96B135, 96S290. Orsova.

EPHYGROBIA Schiner. Type *nitidula*.

EUROPEAN SPECIES.

- apicalis* Perris. 64S242, 96B138, *Hydrellia* 47P494, *Psilopa* 60L9, 89R56. Germany, France.
compta Meig. 30M68, 64S243, 96B143, *Discomyza* var. *B. nitidula* 44S261, *Psilopa* 46Z1932, *Hydrellia compta* 35M524, *Psilopa* 60L56, 89R56. Europe, Silesia.
girschneri v. Rod. 96B141, *Psilopa* 89R55, 89S287. Fundort, Saxony, Poland.
leucostoma Meig. 64S243, 96B142, *Notiphila* 30M68, *Hydrellia* 35M524, *Psilopa* 44S261, 46Z1936, 60L9, 89R56. Sweden, England, France, Germany, Hungary, Russia.
marginella Fall. 96B139, *Psilopa* 23F7, 46Z1939, 55Z4762, *Discomyza* 44S266. Europe.
maritima Perris. 96B139, *Hydrellia* 47P494, *Psilopa* 73L306, 89R56. France.
nana Lw. 96B142, *Psilopa* 60L9, 89R56. Constantinople, Sylt Island.
nigritella Stenh. 64S242, 96B144, *Discomyza* 44S262, *Psilopa* 46Z1935, 60L10, 89R56. Scandinavia, Germany, Austria, Silesia.
nitidula. See *Psilopa*.
obscuripes Lw. 96B144, *Psilopa* 60L10, 89R56, 94S124. Greece, Asia Minor, Hungary.
plumosa. See *Clasiopa*.
polita Macq. 64S243, 96B144, *Hydrellia* 37M524, *Psilopa* 60L10, 89R56, *tarsata* 46Z1934. North and Middle Europe, Silesia.
roderi Girsch. 96B140, *Psilopa* 89G373, 91T244, 91S275, *Diasemocera nigrotacniata* 95B137. Fundort, France, Italy.

OTHER COUNTRIES.

- metallica* Schin. 68S242, 69D374, 96B273. South America.
nigricauda Bigot. 91R278, 91S275. Canary Islands.
pollinosa Kert. 01K81, 01S273. Singapore.
singaporensis Kert. 01K81, 01S273. Singapore.

CLASIOPA Stenhammar.

EUROPEAN SPECIES.

- aurifacies* Strobl. 93S255, 93S320, 96B157. Styria, Silesia.
aurivillii Beck. 96B158, 96S290. Sweden.
bohemanni Beck. 96B159, 96S290. Sweden.
brevipectinata Beck. 96B149, 96S290. Norway.

EUROPEAN SPECIES—Continued.

- calceata* Meig. 64S244, 96B157, *nigrina* 44S254, 46Z87, *Notiphila* 30M69, *Discocerina* 35M524, 60L11, var. *flavountennata* 00S1, 00S308. North and Middle Europe, Silesia.
- cinerella* Stenh. 44S251, 96B158. Germany, Sweden.
- costata* Lw. 60L14, 96B160. Turkey, Asia Minor.
- coxalis* Strobl. 93S253, 93S320, 96B157. Styria.
- dimidiatipennis* Strobl. 93S255, 93S320, 96B150. Styria.
- duplosetosa* Beck. 96B162, 96S290. Malta, Orsova.
- fulgida* Beck. 96B156, 96S290. Orsova.
- glabricula* Fall. 44S256, 64S244, 96B152, *Notiphila* 13F251, 23F10, 46Z1893. Silesia.
- glauccella* Stenh. 44S253, 96B160, *Notiphila* 46Z1883, *Hecamede* 60L14, 64S245, 94S126. Hungary, Sweden, Styria, Silesia.
- globifera*. See *Hecamede albicans*.
- nigerrimana* Strobl. 93S254, 93S320, 96B151. Styria.
- nivea* Beck. 96B151, 96S290. Malta. Silesia.
- niveipennis* Beck. 96B162, 96S290. Silesia.
- obscura* Fall. 44S254, 64S244, 96B148, *Notiphila* 13F251, 23F10, 30M73, *Discocerina* 60L11. North and Middle Europe.
- olivacea* Beck. 96B155, 96S290. Herkulesbad.
- palliditarsis* Beck. 96B155, 96S290. Silesia.
- pallidula* Stenh. 44S257, 96B150. Scandinavia.
- plumosa* Fall. 60L10, *Ephygrobia* 64S242, 94S125, 96B150, *Psilopa* 23F9, 55Z27, *longula* 44S259, *Notiphila* 30M73. North and Middle Europe, Silesia.
- pulicaria* Halid. 53W254, 96B155, *fuscella* 44S256, 46Z1893, *Discomyza* 39H224. Europe.
- xanthocera* Lw. 96B161, *Hecamede* 69L58, *aurella* 93S250. Germany, The Alps, Silesia.

OTHER COUNTRIES.

- albitarsis* v. d. Wulp. 81W56, 81K253, 96B271. Sumatra.

PARATISSA Coquillett. Type *pollinosa*.

- pollinosa* Will. 00C36, 05A626, *Drosophila pollinosa* 96W404. Florida, St. Vincent.

AMALOPTERYX Eaton. Type *maritima*.

- maritima* Eaton. 75E58, 96B272. Kerguelen Islands.

CNESTRUM Becker. Type *lepidopes*.

- lepidopes* Beck. 96B118, 96S290. Germany, Silesia.

ATISSA Haliday. Type *pygmaea*.

- durrenbergensis* Lw. 64L346, 64D512, 96B131. Thuringen.
- limosina* Beck. 96B132, 96S290. Norway, Christiania.
- pygmaea* Halid. 33H174, 53W258, 64S251, 89G223, 89S287, 96B131, *ripicola* 60L24. Germany, Ireland, Italy.
- ripicola*. See *pygmaea*.

ILYTHERA Haliday. Type *spilota*.

NORTH AMERICAN SPECIES.

1. Legs brownish black with yellow rings at the knees.....
.....*spilota* Curtis.
Legs yellow, the tips of the tarsi brownish..*flavipes* Williston.
flavipes Will. 96W403, 97W4, 00C260, 05A625. St.
Vincent, Porto Rico.
oscitans Walk. 57W233, 78OS262, 96B268, 00C260,
05A625. United States.
See **Ephydra** and **Scatella**.
spilota Curt. 60L37, 78OS204, 05A625. North America.

EUROPEAN SPECIES.

2. *spilota* Curt. 32C413, 53W264, 64S263, 96B133, *notata*
44S186. North and Middle Europe, Silesia.

PHILOTELMA Becker. Type *anomala*.

anomala Beck. 96B164, 96S291. Kohlfurter Moor
(Silesia).

BECKERIELLA Williston. Type *bispinosa*.

bispinosa Thoms. 97W2, 97S265, *Ephydra bispinosa*
68T593, 70V442, 96B271. Rio de Janeiro.

GASTROPS Williston. Type *niger*.

1. Antennæ red, third joint at tip and on upper part black....
.....*niger* Williston.
Antennæ, except upper edge and sometimes broad apex of third
joint yellow.....*nebulosus* Coquillett.
nebulosus Coq. 00C34, 05A624. North Carolina, Georgia.
niger Will. 97W3, 97S265, 05A624. Grenada (W. I.),
Rio Janeiro.

APETAENUS Eaton. Type *litoralis*.

litoralis Eaton. 75E58, 96B272. Kerguelen Islands.

CHAMAEBOSCA Speiser. Type *microptera*.

microptera Speis. 03S67. Chile.

NOTE.—Mr. Coquillett seems to have recognized that the species *oscitans* (Walker) belongs in this genus (00C260). In Smith's Catalog of New Jersey species it is placed in **Scatella**. The original Walker description, which places it in **Ephydra**, does not make the generic characters sufficiently certain. It appears that Coquillett or Johnson (Smith's Catalog) should give us a description of this species by which an agreement might be reached in regard to its generic relations. If an *Ilythea*, *oscitans* differs from both *spilota* and *flavipes* in that the antennal arista is bare, while in the former there are six to eight rays and in the latter eight.

HYDRELLINAE.

GLENANTHE Haliday. Type *ripicola*.*fuscinervis* Beck. 96B165, 96S291. Norway.*ripicola* Halid. 39H404, 53W258, 60L16, 64S246, 96B165.
Europe.HYDRELLIA Robineau-Desvoidy. Type *griscola*.

NORTH AMERICAN SPECIES.

1. Entire legs yellow.....*gilvipes* Coquillett.
Legs not entirely yellow..... 2
2. All of the coxæ yellow.....*pulchra* Williston.
Only the anterior coxæ yellow.....*ischiaca* Löw.
None of the coxæ yellow..... 3
3. Face shining white.....*formosa* Löw.
Face snowy white.....*hypoleuca* Löw.
Face pale yellow..... 4
Face dark yellow, narrow, much widened below.....
.....*scapularis* Löw.
Face brownish-black opaque..... 5
4. Face rather broad, but little widened below.....*valida* Löw.
Face narrow, much dilated below as in *scapularis*.....
.....*conformis* Löw.
5. Abdomen brownish metallic green, somewhat glossy.....
.....*obscuripes* Löw.
Abdomen black but little shining, thinly grayish dusted.....
.....*parva* Williston.
apicalis. See *Ephygrobia*.
compta. See *Ephygrobia*.
conformis Lw. 69L41, 72L73, 69D444, 78OS202, 96B270,
05A626. Newport (R. I.).
formosa Lw. 61L355, 62L154, 65L94, 78OS202, 96B270,
00H593, 05A626. Pennsylvania.
gilvipes Coq. 00C261, 00S309, 05A627. Porto Rico.
hypoleuca Lw. 62L151, 78OS202, 96B269, 05A627.
Middle States.
ischiaca Lw. 62L150, 78OS202, 96B269, 05A627. Middle
States.
maritima. See *Ephygrobia*.
nitidula. See *Psilopa*.
obscuripes Lw. 62L152, 78OS202, 96B269, 02S8, 05A627.
Middle States, White Mountains (N. H.).
parva Will. 96W399, 96S291, 05A627. St. Vincent.
pulchra Will. 96W400, 96S291, 05A627. St. Vincent.
scapularis Lw. 62L153, 78OS202, 96B269, 00C461, 02S320,
05A627. New Jersey, Illinois west to California.
valida Lw. 62L153, 78OS202, 96B269, 05A627. Middle
States.

EUROPEAN SPECIES.

albiceps. See *mutata*.*albifrons*. See *nigricans*.*albilabris* Meig. 53H258, 56H345, 60L18, 64S248, 66F973,
66D512, 96B183, *argyria* 30RD793, *argyrostoma* 44S236,
Notiphila 46Z1895, *albilabris* 30M71. North and Middle
Europe, Silesia.

EUROPEAN SPECIES—Continued.

- argyrostoma*. See *albilabris*.
aryrogenis Beck. 96B185, 96S290. Milan.
caesia Stenh. 44S214, 60L18, 64S249, 96B176, *Notiphila* 46Z1880. Sweden, Germany.
cardamines. See *flavilabris* and *laticeps*.
concolor Stenh. 44S216, 60L20, 64S247, 96B178, *cinerascens* 35M526, *Notiphila concolor* 46Z1877. Sweden, Germany, Austria.
discolor Stenh. 44S230, 60L22, 64S250, 96B179, *flaviceps* 39H345, *Notiphila* 30M72, *discolor* 46Z1900. England, Sweden, Germany, Hungary, Silesia.
erythrostoma. See *nigripes*.
flavicornis Fall. 96B177, *Notiphila* 23F10, 46Z1873. Germany, Sweden, Hungary, Silesia. See also *nigripes*.
flavilabris Stenh. 44S235, 94S126, 96B173, *cardamines* 39H402. Styria.
frontalis Lw. 60L19, 64S249, 96B183. Silesia.
fulvipes Stenh. 44S231, 60L21, 64S248, 96B173, *Notiphila* 46Z1901, *chrysostoma* 30M67. Germany, Sweden, Silesia.
fusca Stenh. 44S225, 60L24, 64S250, 96B178, *Notiphila* 46Z1896. Sweden, Germany.
genicula Stenh. 44S224, 60L18, 64S248, 96B174, *Notiphila* 46Z1878. Germany, Sweden.
grisea. Stenh. 44S227, 60L21, 64S249, 96B179, *Notiphila* 46Z1898. Sweden, Germany, Russia.
griseola Fall. 44S220, 60L22, 64S247, 96B180, *Notiphila* 13F254, 23F9, 30M66, 38Z717, 46Z1869. Europe, Silesia.
hispanica. See *nigricans*.
incana. See *ranunculi*.
lamina Beck. 96B184, 96S291. Leignitz.
lapponica Stenh. 44S237, 96B174. Pavia.
laticeps Stenh. 44S229, 60L20, 64S248, 96B172, *cardamines* 39H402, *Notiphila laticeps* 46Z1899. North and Middle Europe, Silesia.
maculiventris Beck. 96B175, 96S291. Silesia.
modesta Lw. 60L23, 64S250, 96B181. Europe.
mutata Zett. 60L19, 64S247, 94S126, 96B176, *plumosa* 44S218, *albiceps* 56W345, *Notiphila mutata* 46Z1876. Sweden, Germany, Silesia.
nigricans Stenh. 44S234, 64S250, 96B183, *nigrina* 60L24, var. *hispanica* 00S1, 00S309, *albifrons* 44S223, *Notiphila* 23F10. Sweden, Germany, Austria.
nigrina. See *nigricans*.
nigripes Zett. 60L22, 64S248, 96B181, *flavicornis* 44S232, 56W345, *erythrostoma* 53W257, *Notiphila* 30M69, *nigripes* 38Z717. North and Middle Europe, Silesia.
nymphaeae Stenh. 44S227, 60L23, 96B182, *Notiphila* 46Z1897. Sweden.
pilitarsis Stenh. 44S219, 60L20, 64S249, 96B173, *Notiphila* 46Z1881. Sweden, Germany.
plumosa. See *mutata*.

EUROPEAN SPECIES—Continued.

- ranunculi* Halid. 39H402, 53W256, 60L23, 64S247,
96B182, *incana* 44S222, *Notiphila* 46Z1871, *griseola*
23F9. Europe, Silesia.
thoracica Halid. 39H402, 53W256, 60L18, 64S249,
96B183. England, Germany, Silesia.
transsylvana Beck. 96B184, 96S291. Transylvania.

OTHER COUNTRIES.

- tritica* Coq. 03C324. Australia.

NOSTIMA Coquillett. Type *slossonae*.

- slossonae* Coq. 00C35, 00S310, 05A627. Florida.

AXYSTA Haliday. Type *cesta*.

- cesta* Halid. 33H177, 53W262, 60L28, 64S255, 96B167,
Philygria punctulata 44S241, *Trimerina coeruleiventris*
35M529. North and Middle Europe.

PHILYGRIA Stenhammar.

NORTH AMERICAN SPECIES.

1. Posterior portion of abdomen differing in color, or at least in lustre from anterior portion..... 2
Abdomen concolorous throughout..... 3
2. Prevailing color blackish cinereous, antennæ entirely black....
.....*debilis* Löw.
Prevailing color brownish gray, third antennal joint reddish,
yellow beneath.....*vittipennis* Zetterstedt.
3. Prevailing color brown..... 4
Prevailing color black..... 5
4. Transverse veins margined with blackish brown.....
.....*fuscicornis* Löw.
Transverse veins broadly clouded with black....*opposita* Löw.
5. Coxæ light yellow.....*nitida* Williston.
Coxæ black.....*nitifrons* Williston.

- debilis* Lw. 61L357, 62L157, 65L96, 78OS202, 96B269,
02S8, 05A627. Pennsylvania, White Mountains (N. H.).
fuscicornis Lw. 62L155, 78OS202, 96B269, 02S8,
05A627. Middle States, White Mountains (N. H.).
nitida Will. 96W400, 96S291, 05A627. St. Vincent.
nitifrons Will. 96W401, 96S291, 05A627. St. Vincent.
opposita Lw. 61L356, 62L156, 65L95, 78OS202, 96B269.
Pennsylvania.
vittipennis Zett. 78OS202, 96B270. Greenland.

EUROPEAN SPECIES.

abdominalis. See *Lytogaster*.

- femorata* Stenh. 44S245, 64S253, 96B190, *Notiphila*
23F12. Scandinavia, Germany, Silesia.
flavipes Fall. 35M525, 44S244, 60L26, 64S252, 96B191,
Notiphila 23F12, 46Z1916, *Ephydra* 30M123. Europe,
Silesia.
interrupta Halid. 53W261, 60L26, 64S253, 96B189,
Hydrina 34H176. Middle Europe, Silesia.

EUROPEAN SPECIES—Continued.

- interstincta* Fall. 44S246, 64S253, 96B190, *Notiphila* 13F254, 23F12, 46Z1919. Europe.
- nigricauda* Stenh. 44S248, 96B192, *Notiphila* 46Z1923. Scandinavia, Germany, Silesia, Transylvanian Alps.
- obtecta* Beck. 96B122, 96S291. Silesia.
- picta* Fall. 44S243, 60L25, 64S253, 96B192, *Notiphila* 13F254, 23F11, 46Z1913, *Ephydra* 30M125. North and Middle Europe, Silesia.
- punctatonervosa* Fall. 44S247, 53W260, 60L25, 64S252, 96B188, *Notiphila* 13F254, 23F12, 46Z1921, *Ephydra* 30M123. North and Middle Europe, Silesia.
- punctulata*. See *Axysta cesta*.
- sexmaculata* Beck. 96B191, 96S291, *Ephydra interstincta* 30M122, 35M539, *Hydrina maculipennis* 30RD795. North and Middle Europe.
- stictica* Meig. 60L25, 64S253, 96B189, *Ephydra* 30M121. Germany, Silesia.
2. *vittipennis* Zett. 44S250, 46Z1924, 60L26, 64S253, 96B193, *Notiphila* 38Z718. Europe.

HYADINA Haliday.

NORTH AMERICAN SPECIES.

1. Third antennal joint reddish, infuscated toward the tip.....
.....*gravida* Löw.
Third antennal joint black above, yellow beneath.....
.....*albovenosa* Coquillett.
- albovenosa* Coq. 00C34, 00S309, 05A627. Georgia, Louisiana.
- gravida* Lw. 63L325, 72L98, 78OS202, 96B270, 05A627. Sitka.

EUROPEAN SPECIES.

- guttata* Fall. 30RD795, 44S239, 53W261, 60L27, 64S254, 96B194, 00S2, 00S309, *Ephydra* 30M125, *Notiphila* 13F253, 23F11, 38Z718, 46Z1914. North and Middle Europe.
- interrupta*. See *Philygria*.
- humeralis* Beck. 96B195, 96S291. Germany.
- nitida* Macq. 60L28, 64S254, 96B194, *Ephydra* 35M539, *Notiphila brevicornis* 46Z1912, *guttata* var. *brevicornis* 44S240. North and Middle Europe, Silesia.
- scutellata* Halid. 39H406, 53W262, 96B195. Ireland, Silesia.
- sexmaculata*. See *Philygria*.

EPHYDRINAE.

OCHTHERA Latreille. Type *mantis*.

NORTH AMERICAN SPECIES.

1. Face with impressed black lines radiating from an orbital groove.....*lauta* Wheeler.
Face without such lines.....

NORTH AMERICAN SPECIES—Continued.

2. Face with deep black furrows and dots.....*exsculpta* Löw.
Face without black furrows and dots..... 3
3. Mesonotum with three dark purple and coppery stripes.....
.....*cuprilineata* Williston.
Mesonotum without such stripes..... 4
4. First joint of hind tarsi but little swollen...*mantis* De Geer.
First joint of hind tarsi much swollen..... 5
5. Tarsi black, face broad.....*rapax* Löw.
Tarsi red, face narrow.....*tuberculata* Löw.

cuprilineata Will. 96W402, 96S291. St. Vincent.

exsculpta Lw. 62L160, 78OS202, 86W307, 95J338, 96B269,
05A628. Cuba, Florida.

lauta Wheel. 96W121, 96S291, 05A628. Milwaukee
(Wis.).

mantis Deg. 62L161, 78OS202, 95GT66, 96W123, 96B269,
96S264, 05A628. Middle States, White Mountains
(N. H.), Connecticut to California, Mexico.

rapax Lw. 62L162, 78OS202, 96B269, 05A628. Carolina.

tuberculata Lw. 62L161, 78OS202, 95J338, 96B269,
96W123, 05A628. Illinois, Wisconsin, Florida.

EUROPEAN SPECIES.

2. *mantis* Deg. 1809L348, 35M519, 38Z715, 44S166, 46Z1804,
60L30, 62L161, 64S256, 96B204, *Musca* 1782D61,
manicata 1798F334, *Macrochira mantis* 30M78, *Tephritis*
manicata 05F323, 23F2. Whole of Europe.
- mantispa* Lw. 47L273, 60L30, 96B205, *Schembri* 47R29.
Italy, Greece, Asia Minor.
- schembri*. See *mantispa*.

OTHER COUNTRIES.

- chalybescens* Lw. 62L14, 96B268. Cape of Good Hope.
humilis Will. 97W6, 97S265. Brazil.
innotata Walk. 60W171, 96B267. Celebes.
praedatoria Lw. 62L14, 96B268. Caffraria.
regalis Will. 97W6, 97S265. Brazil.
rotunda Schin. 68S243, 69D374, 96B273. Nikobara.

OCHTHEROIDEA Williston. Type *atra*.

atra Will. 96W401, 96S291. St. Vincent.

ECTROPA Schiner. Type *viduata*.

viduata Schin. 68S243, 68D374, 96B201. Sydney.

PELINA Haliday. Type *acnea*.

NORTH AMERICAN SPECIES.

truncatula Lw. 78L198, 78OS202, 78K244, 96B270,
05A628. Texas.

EUROPEAN SPECIES.

acnea Fall. 13F253, 23F11, 46Z1926, 60L30, 64S255,
96B197, *glabricula* 30M124, *Telmatobia* 44S209.
Europe.

EUROPEAN SPECIES—Continued.

aenescens Stenh. 44S201, 46Z1928, 60L30, 96B198, *aenea* 38Z718, *Miki* 93S280. Scandinavia, England, Austria, Silesia.

guttipennis Stenh. 96B199, *Telmatobia* 44S212. Europe.

nitens Lw. 73L309, 73R427, 96B199. Calabria.

subpunctata Beck. 96B198, 96S291. Dalmatia.

ventruosa. See *Lytogaster abdominalis*.

LYTOGASTER Becker. Type *abdominalis*.

abdominalis Stenh. 96B203, *Philygria* 44S238, *Pelina ventruosa* 73L310. Silesia.

DOMINA Hutton. Type *metallica*.

metallica Hutt. 01H90, 01S272. New Zealand.

BRACHYDEUTERA Loew. Type *argentata*.

NORTH AMERICAN SPECIES.

argentata Lw. 05A628, *dimidiata* 62L163, 78OS203, 95J338, 96B269, *Notiphila* 56W406. District of Columbia, Florida.

dimidiata. See *argentata*.

EUROPEAN SPECIES.

argentata Walk. 96B201, *dimidiata* 62L163, *Ephydra* 56W407. Europe.

dimidiata. See *argentata*.

HALMOPOTA Haliday. Type *salinaria*.

mediterranea Lw. 60L34, 96B206. Asia Minor.

salinaria Bouche. 56W346, 60L34, 64S260, 96B205, *Ephydra* 34B99. England, Germany, Silesia.

PARYDRA Stenhammar.

NORTH AMERICAN SPECIES.

1. Scutellum with conical warts..... 2
Scutellum without conical warts..... 5
2. Scutellum with one wart, apex not bearing a spine..... 3
Scutellum with two warts, apices with spines..... 4
Scutellum with four warts.....*quadrituberculata* Löw.
3. Abdomen subopaque, tips of femora, base and tips of tibiae, and metatarsi dark reddish.....*imitans* Löw.
Abdomen black, legs without reddish coloring.....*unituberculata* Löw.
4. Tubercles exceedingly small, hairing of face snow white.....*pinguis* Walker.
Tubercles not unusually small, hairing of face not white.....*bituberculata* Löw.
5. Face nearly perpendicular.....*breviceps* Löw.
Face more or less oblique..... 6
6. Clypeus and cheeks excessively narrow.....*pauillula* Löw.
Clypeus and cheeks not excessively narrow..... 7
7. Second longitudinal vein with a branch near its end..... 8
Second longitudinal vein without such branch..... 10

NORTH AMERICAN SPECIES—Continued.

8. Fourth longitudinal vein with a small but very distinct gray fringe near its apex, third with a similar spot less distinctly visible.....*appendiculata* Löw.
Third and fourth longitudinal veins without such markings.... 9
9. Wings with seven rather large hyaline spots...*abbreviata* Löw.
Wings with five hyaline spots.....*varia* Löw.
10. Wings brownish with five hyaline spots, cross veins brown....
.....*aurata* n. sp.
Wings hyaline, cross veins blackish.....*limpidipennis* Löw.
- abbreviata* Lw. 61L357, 62L168, 65L97, 78OS203, 96B269, 05A629. Pennsylvania.
- appendiculata* Lw. 78L202, 78OS203, 78K244, 96B270, 05A629. Texas, California.
- aurata* n. sp. Southern California.
- bituberculata* Lw. 62L165, 78OS203, 96B269, 05A629.
Middle States, New Jersey.
- breviceps* Lw. 62L167, 78OS203, 96B269, 05A629.
Middle States.
- imitans* Lw. 78L201, 78OS203, 78K244, 96B270, 05A629.
Massachusetts.
- limpidipennis* Lw. 78L201, 78OS203, 78K244, 96B270, 05A629. District of Columbia.
- paullula* Lw. 62L167, 78OS203, 96B269, 00C462, 05A629.
Middle States, Alaska.
- pinguis* Walk. 78L199, 78OS203, 78K243, 05A629, *Ephydra* 56W409, 96B266. District of Columbia, Texas, New Jersey.
- quadrītuberculata* Lw. 62L165, 64S258, 78OS203, 95J338, 96B269, 05A629. Middle States, Florida.
- unituberculata* Lw. 78L200, 78OS203, 78K244, 96B270, 05A629. District of Columbia.
- varia* Lw. 63L326, 65L100, 78OS203, 96B270, 05A629.
Sitka.

EUROPEAN SPECIES.

- affinis*. See *fossarum*.
- aquila* Fall. 44S187, 46Z1819, 60L32, 64S259, 64D559, 96B211. *Ephydra* 23F4, 30M117, 35M537, 38Z716, North and Middle Europe, Silesia.
- bicuspidata* Kars. 81K15, 81K253. Porto Allegre.
- coarctata* Fall. 44S189, 46Z1821, 60L33, 64S258, 96B214, *Ephydra* 23F4, *rufitarsis* 30M126, 35M356, *stagnicola* 30RD799, *hecate*? 53H263. Whole of Europe, Silesia.
- cognata* Lw. 60L32, 96B212. Prussia, Sicily.
- fossarum* Halid. 33H175, 60L32, 64S260, 96B211, *affinis* 44S192, 46Z1824. North and Middle Europe, Silesia.
- furcata*. See *quadripunctata*.
- littoralis* Meig. 30M116, 60L33, 64S259, 96B214. Prussia, Germany, Silesia.
- nigritarsis* Strobl. 93S280, 93S321, 96B215. Styria.
- nubecula* Beck. 96B212, 96S291. Prussia, Silesia.
- obliqua* Beck. 96B215, 96S291. Crete, Italy.
- pubera* Lw. 60L32, 96B210. Sicily, Calabria.

EUROPEAN SPECIES—*Continued*.

pusilla Meig. 30M126, 60L32, 64S259, 96B211, *Ephydra infecta* 33H175, *nasuta* 44S192, 46Z1825. North and Middle Europe, Silesia.

quadripunctata Meig. 30M117, 3SZ716, 46Z1822, 60L33, 64S258, 96B214, *furcata* 44S190. North and Middle Europe, Silesia.

undulata Beck. 96B213, 96S291. Russia, Berlin.

OTHER COUNTRIES.

bucculenta Lw. 62L14, 96B268. Caffraria.

humilis Will. 97W7, 97S266. Brazil.

EPHYDRA Fallen. Type *riparia*.

NORTH AMERICAN SPECIES.

1. Thorax lemon yellow.....*lutea* Wiedmann. 2
- Thorax ashy, with slight greenish reflection..... 3
- Thorax black or brownish black..... 8
- Thorax dark green..... 11
- Thorax metallic or coppery green.....
2. Thorax with three broad vittæ, front brassy green...*cinerea* n. sp.
- Thorax without vittæ, front dark bluish.....*hians* Say. 4
3. Wings except along veins blackish or smoky..... 5
- Wings gray or hyaline.....
4. Front except the lateral margins, shining, slightly greenish....
-*californica* Packard.
- Front opaque velvety black.....*pygmaea* Williston.
- Front grayish white, dusted with brownish...*thomae* Wiedmann.
5. Thorax dull..... 6
- Thorax shining..... 7
6. Abdomen shining.....*brevis* Walker.
- Abdomen not shining.....*tarsata* Williston.
7. Legs piceous.....*lata* Walker.
- Legs pale yellow.....*nana* Walker.
8. Third antennal joint with a lateral hair..... 9
- Third antennal joint without a lateral hair..... 10
9. Wings clouded with blackish gray.....*atrovirens* Löw.
- Wings grayish hyaline, not clouded.....*pilicornis* Coquillett.
10. Thorax opaque.....*obscuripes* Löw.
- Thorax shining.....*austrina* Coquillett.
11. First joint of front tarsi incrassated.....*crassimana* Löw.
- First joint of front tarsi not incrassated..... 12
12. Third antennal joint minute, sunken in the head.....
-*halophila* Packard.
- Third antennal joint not minute, not sunken in the head.... 13
13. Antennæ dark brown, arista with short pectinations.....
-*millbrae* n. sp.
- Antennæ black, arista with long pectinations...*subopaca* Löw.

NOTE.—*E. gracilis* described in larval stages only.

NOTE.—*oscitans* (Walker) certainly differs from all others of this genus in the markings of the wings, and if in this genus at all probably belongs near *pygmaea* or *thomae*, from which it differs in that the front is dark brown.

NORTH AMERICAN SPECIES—Continued.

- atrovirens* Lw. 62L169, 78OS203, 96B269, 05A629. Middle States.
austrina Coq. 00C36, 05A629. Georgia, Florida.
brevis Walk. 57W233, 78OS203, 96B268, 05A629. United States.
californica Pack. 71P103, 71R397, 84K266, 84W90, 05A629. California, Nevada.
cinerea n. sp. Southern California.
crassimana Lw. 65L182, 65L88, 65D664, 78OS200, 96B270, 05A629. Mexico.
gracilis Pack. 71P105, 71R397, 91S235, 05A629. Great Salt Lake (Utah).
halophila Pack. 68P46, 69D444, 78OS203, 96B270, 05A629. Illinois.
hians Say. 30S188, 83S371, 83K250, 83P976, 78OS200, 96B270, 05A630. Mexico.
lata Walk. 57W233, 96B268, 05A630. United States.
lutea Wied. 30W593, 96B266, 05A630. West Indies.
millbrae n. sp. Millbrae (California).
nana Walk. 57W234, 95J339, 96B268, 05A630. United States.
obscuripes Lw. 66L50, 66D512, 72L92, 78OS200, 96B270, 96S290, 05A630. Massachusetts.
octonotata. See *Scatella*.
ocitans Walk. See *Ilythea* and *Scatella*.
pentastigma. See *Scatella*.
picea. See *Scatella*.
pilicornis Coq. 02C184, 02S264, 05A630. Florida.
pygmaea Will. 96W402, 96S290, 05A630. St. Vincent.
striata. See *Scatella*.
subopaca Lw. 64L98, 64D559, 65L99, 78OS200, 95J339, 96B270, 05A630. Connecticut, New Jersey, Florida.
tarsata Will. 93W257, 93S320, 05A630. Owens Valley (California).
thomae Weid. 30W593, 96B266, 05A630. St. Thomas (West Indies).

EUROPEAN SPECIES.

- aquila*. See *Parydra*.
argentata. See *Brachydeutera*.
argyrostoma. See *Scatella sorbillans*.
attica Beck. 96B222, 96S290. Greece.
aurata. See *micans*.
beckeri (new name) *obscuripes*. 96B222. Sarepta.
bivitatta Lw. 60L35, 96B219. Prussia, Sicily.
breviventris Lw. 60L37, 64S261, 96B219. Southern Europe.
cribrata. See *Scatella*.
fenestrata. See *Scatophila despecta*.
flavescens. See *Scatella lutosa*.
flaviceps. See *Philygria*.
flavipennis. See *Scatella aestuans*.
gramium. See *Scatella quadrata*.
guttata. See *Hyadina*.
halophila. See *riparia*.

EUROPEAN SPECIES—*Continued.*

- hecate*. See *Parydra coarctata*.
infecta. See *Parydra pusilla*.
longipennis. See *Teichomyza*.
macellaria Egg. 62E779, 64S262, 96B220. Europe, Southern Russia.
micans Halid. 33H175, 60L36, 64S261, 96B218, *aurata* 44S167, 46Z1810, *riparia* 23F4. Whole of Europe, Silesia.
nasuta. See *Parydra pusilla*.
nubilipennis. See *Scatella sibilans*.
obscuripes. Preoccupied, see *beckeri*.
ochrostoma Brul. 35B689, 96B224. Europe.
opaca Lw. 56L55, 96B222. Egypt, Southern Europe.
pinguis. See *Parydra*.
punctinervosus. See *Philygria*.
quadrata. See *Scatella*.
riparia Fall. 13F246, 23F3, 30M117, 38Z715, 44S169, 46Z1807, 53W268, 60L35, 64S262, 96B221, *salina* 43H228, *halophila* 44H203. North coast of Europe. See also *micans* and *Caenia fumosa*.
rufitarsus. See *Parydra coarctata*.
salina. See *riparia*.
salinae Zett. 46Z1912, 60L36, 96B219. North and Middle Europe.
salinaria. See *Halmopota*.
seemaculata. See *Philygria*.
Scholtzi Beck. 96B220. Silesia, Poland.
stagnalis. See *Scatella* and *Scatophila despecta*.
stagnicola. See *Parydra coarctata*.
stenhammari. See *Scatella*.
stictica. See *Philygria*.

OTHER COUNTRIES.

- aquaria* Hutt. 01H90, 01S273. New Zealand.
australis Walk. 56W409, 96B266. Van Dieman's Land.
bispinosa. See *Beckeriella*.
borboroides Walk. 60W171, 96B267. Celebes.
caesia v. d. Wulp. 83W58, 83K251, 96B271. Argentina.
ciligena Rond. 68R32, 68D374. Buenos Ayres.
gilvipes Coq. 01C377, 01S272. Galapagos.
maculicornis Walk. 60W171, 96B267. Celebes.
margaritata Wied. 30W593, 96B266. Egypt.
ochropus Thoms. 68T592, 70V442, 96B271. Montevideo.
pictipennis Wied. 30W593, 64D559, 96B266. Cape of Good Hope.
pleuralis Thoms. 68T591, 70V442, 96B271. Manila.
prionoptera Thoms. 68T590, 70V442, 96B271. Patagonia.
taciturna Walk. 60W169, 96B267. Amboyna.
urmiana Gunth. 99G415, 99S239. Northwest Persia.

SCATOPHILA Becker. Type *caviceps*.

NORTH AMERICAN SPECIES.

- hamifera* Beck. (See "University Collection.") Alameda (California).

EUROPEAN SPECIES.

- caviceps.** Sten. 96B240, 96S292, *Scatella* 44S269, 46Z1837, 60L42, 64S265. Scandinavia, Germany, Silesia.
- contaminata** Stenh. 96B240, *Scatella* 44S185. Sweden, Silesia.
- cribrata.** See **Scatella.**
- despecta** Halid. 96B241, *Scatella* 39H409, 60L43, 64S267, *Ephydra stagnalis* 23F5, *fenestrata* 44S181, 46Z1831. North and Middle Europe, Silesia.
- halterata** Beck. 96B245, 96S292. Koblfurt, Silesia.
2. **hamifera** Beck. 96B242, 96S292. Norway.
- laevigata** Lw. 96B243, *Scatella* 60L44. Silesia.
- pumilio** Lw. 96B244, *Scatella* 60L44, 64S267. Silesia.
- quadrilineata** Strobl. 00S4, 00S310. Spain.
- signata** Lw. 96B241, *Scatella* 60L43. Sicily, Hungary.
- tetra** Beck. 96B244, 96S292. Löw's Collection (probably Silesia).
- unicornis** Czer. 00C205, 00S310. Austria.
- variegata** Lw. 96B243, *Scatella* 60L43, 64S267. Silesia, Dorpat.

PELOMYIA Williston. Type *occidentalis*.

- occidentalis** Will. 93W258, 93S321, 96B274, 00C461, 05A628. Monterey (California), Sordova (Alaska).

TEICHOMYZA Macquart. Type *fusca*.

- fusca** Macq. 35M535, 60L45, 64S268, 86G160, 86S312, 90H239, 90S290, 96B206, *Scatella urinaria* 30RD6, *Ephydra longipennis* 38M382. England, France, Germany, Italy, Silesia.

SCATELLA Robineau-Desvoidy. Type *stagnalis*.

NORTH AMERICAN SPECIES.

1. Face in profile almost perpendicular, decidedly haired and ciliated.....*stagnalis* Fallen. 2
- Face not unusually perpendicular, hairing not pronounced.... 2
2. Thorax, coxæ, femora and tibiæ whitish cinereous, wings irregularly streaked with whitish hyaline..*mesogramma* Löw. Little or none of the body whitish cinereous, wings usually with definite spots..... 3
3. Spots of the wings hyaline or whitish..... 4
- Spots of the wings brown..... 5
4. Wings with four white spots..... 7
- Wings with five white spots..... 9
- Wings with seven or eight white spots..... 10
- Wings with ten white spots.....*striata* Walker.
5. Two large brown spots between the first cross vein and the point of the wing beyond the third longitudinal.....*quadrata* Fallen. 6
- Three or more brown spots beyond the third longitudinal and behind the first cross vein.....
6. Base of the tarsi black.....*stenhammari* Zett.
- Base of the tarsi more or less reddish.....*sejuncta* Löw.

NORTH AMERICAN SPECIES—*Continued*.

7. Wing with a small pitchy spot at the tip of the first longitudinal.....*picea* Walker. 8
 Wings without such spot.....
8. Body ash gray.....*favillacea* Löw.
 Body olive green.....*triseta* Coquillett.
 Body brown.....*octonotata* Walker.
9. Head and chest blackish opaque, densely bluish-gray pruinose.....*setosa* Coquillett.
 Head and chest blackish with olivaceous pruinosity.....*pentastigma* Thomson.
 Head and chest yellowish cinereous.....*obsoleta* Löw.
 Head and chest ferrugineous.....*repleta* Walker.
10. Abdomen flecked with white laterally...*cribrata* Stenhammar.
 Abdomen not flecked with white.....*lugens* Löw.

cribrata Stenh. 00L303, 05A630. Greenland.

favillacea Lw. 62L170, 78OS203, 96B269, 05A630.

Middle States, New Jersey.

lugens Lw. 62L171, 78OS203, 95J339, 96B289, 05A630.

Middle States, Florida.

mesogramma Lw. 69L42, 69D444, 72L74, 78OS203, 96B270, 05A630. Newport (R. I.).

obsoleta Lw. 62L172, 65L98, 78OS204, 96B269, 05A630.

Washington (D. C.).

octonotata Walk. 05A630, *Ephydra* 49W1106, 96B267.

Martin Falls (Canada).

oscitans Walk. See *Ilythea* and *Ephydra*.

pentastigma Thoms. 05A630, *Ephydra* 68T591, 70V442, 78OS204, 96B271. California.

picea Walk. 05A630, *Ephydra* 49W1105, 78OS204, 96B266. Martin Falls (Canada).

quadrata Fall. 23F5, 64L317, 64S265, 78OS204, 96B270, 05A630. North America.

repleta Walk. 05A630, *Notiphila* 49W1099, 96B266. Martin Falls (Canada).

sejuncta Lw. 63L326, 65L99, 78OS204, 96B271, 05A631. Sitka (Alaska).

setosa Coq. 00C462, 00S310, 05A631. Alaska.

stagnalis Fall. 45S169, 72H97, 78OS204, 86G162, 86S312, 96B271, 96S264, 98L303, 00C462, 00H593, 05A631, *obscura* 96W403. Greenland, Alaska, New Jersey, Georgia, Arizona, St. Vincent, Montreal, White Mountains (N. H.).

stenhammari Zett. 78OS204, 96B271. North America. North America.

striata Walk. 05A631, *Ephydra* 49W1107, 96B267. Martin Falls (Canada).

triseta Coq. 02C184, 02S265, 05A631. Arizona.

NOTE.—*oscitans*, if a *Scatella*, is probably most closely related to *S. striata*, from which it differs in the absence of five hoary stripes on the chest.

EUROPEAN SPECIES.

- aestuans* Halid. 33H176, 64S266, 96B233, *Ephydra flavipennis* 44S173, *gilva* 60L41. Asia Minor, Southern Hungary.
- callosicosta* Bezzi. 95B70, 95S345, 96B232. Calabria, Orsova, Silesia.
- contaminata*. See *Scatophila*.
- crassicosta* Beck. 96B234, 96S291. Sylt Island.
2. *cribrata* Stenh. 60L42, *Scatophila* 64S265, 96B240, *Ephydra* 44S269, 46Z1835. North and Middle Europe.
- defecta* Halid. 33H174, 46Z1813, 60L38, 96B236, *Caenia* 53W265. Triest.
- despecta*. See *Scatophila*.
- dichaeta* Lw. 60L40, 96B228. Harz, Sylt Island, Sweden.
- indistincta* Beck. 96B231, 96S291. Hungary.
- laevigata*. See *Scatophila*.
- lutosa* Halid. 33H176, 60L42, 64S266, 96B236, *Ephydra flavescens* 44S175, 46Z1830. North and Middle Europe, Silesia.
- pilosigenis* Beck. 96B229, 96S291. East coast of Europe.
- pumila*. See *Scatophila*.
2. *quadrata* Fall. 30M119, 39H410, 44S182, 46Z1840, 60L40, 64S265, 96B230, *Ephydra* 23F5, *graminum* 33H176. Whole of Europe, Silesia. See also *stenhammari*.
- quadrisetosa* Beck. 96B229, 96S291. Norway.
- sibilans* Halid. 33H175, 60L40, 64S265, 96B228, *Ephydra nubilipennis* 44S180. North and Middle Europe, Silesia.
- signata*. See *Scatophila*.
- silacea* Lw. 60L41, 64S266, 96B233. Silesia.
- sorbillans* Halid. 33H176, 60L41, 64S265, 96B231, *Ephydra argyrostoma* 44S176, 46Z1831. Whole of Europe, Silesia.
2. *stagnalis* Fall. 44S178, 46Z1827, 60L42, 64S266, 96B235, *Ephydra* 13F248, 23F5. North and Middle Europe, Silesia.
2. *stenhammari* Zett. 60L40, 64S266, 96B230, *quadrata* 44S183, *Ephydra stenhammari* 46Z1842. North and Middle Europe, Silesia.
- urinaria*. See *Teichomyza*.
- variegata*. See *Scatophila*.

OTHER COUNTRIES.

- hawaiiensis* Grim. 01G49, 01S274. Oahu (Sandwich Islands).
3. *stagnalis* Fall. 97W5, 97S266. Brazil.

CAENIA Robineau-Desvoidy. Type *palustris*.

NORTH AMERICAN SPECIES.

1. Front black, clothed with long bristles.....*spinosa* Löw.
Middle of front bronze green, partially covered with short hairs, but without long bristles.....*bisetosa* Coquillett.
- bisetosa* Coq. 02C183, 02S263, 05A631. Utah, California.
- spinosa* Lw. 64L99, 65L100, 64D559, 78OS204, 95J339, 96B271, 05A631. New York, Florida, New Jersey.

EUROPEAN SPECIES.

- beckeri* Kuntze. 97K154, 97S265. Rome.
carriicola. See *palustris*.
fumosa Stenh. 44S171, 46Z1813, 60L38, 64S264, 96B207,
Ephydra riparia 23F4. North and Middle Europe,
 Silesia.
obscura Meig. 30M115, 53W265, 60L38, 96B208. Ger-
 many, England.
palustris Fall. 23F4, 30M115, 35M530, 38Z716, 44S172,
 46Z1815, 60L38, 64S264, 96B207, *carriicola* 30RD800.
 Whole of Europe, Silesia.

NOMBA Walker. Type *tecta*.

tecta Walk. 60W169, 96B267. Celebes.

CANACENAE.

CANACE Haliday. Type *nasica*.

- nasica* Halid. 39H411, 53W269, 60L29, 64S269, 74L80,
 96B247. Ireland. See also *ranula*.
ranula Lw. 74L81, 74R449, 87S297, 87G1, 96B247.
nasica 55H64. North coast of England, Germany.
salonitana Strobl. 00S63, 00S308. Salona.
snodgrassi Coq. 01C378, 01S272. Galapagos.

GENERA APPEARING ONLY IN THE SYNONYMY.

- Diasemocara*.
nigrotaeniata. See *Psilopa* and *Ephygrobia roderi*.
Drosophila.
pollinosa. See *Paratissa*.
Glabrinus.
mororum. See *Gymnopa subsultans*.
Hydrina.
guttata. See *Hyadina*.
Keratocera.
palustris. See *Notiphila cinerea*.
tarsata. See *Notiphila*.
Macrochira.
mantis. See *Ochthera*.
Mosillus.
arcuatus. See *Gymnopa subsultans*.
Musca.
manicata. See *Ochthera mantis*.
Telmatobia.
aenea. See *Pelina*.
Tephritis.
manicata. See *Ochthera mantis*.
Uliida.
arcuata. See *Gymnopa subsultans*.

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Vol. 1, No. 3, pp. 199-216

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THE NORTH AMERICAN MIRIDAE

BY

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The following keys cover all but eight of the genera of the Miridae thus far recorded from America north of Mexico. These eight genera were omitted on account of the want of material for study or because their occurrence in this country is a matter of much uncertainty. Dr. Reuter's great work on the Capsidae of Europe (*Hemiptera Gymnocerata Europae*, 5 vols., 1878-1896) and his later studies in the North American fauna have formed the foundation for the present paper, although the keys given here are for the most part original. I have found it impossible to work out his subfamilies of 1910 in a satisfactory analytical form, and, while accepting them in my catalogue of our Hemiptera, I have ignored them in the preparation of these keys, using only his tribes, or divisions as he terms them. In addition to these tribes I have found it both practicable and useful to establish groups of a lower category in two of the larger tribes which have been denominated divisions with the termination *-aria*. All synonymy has been omitted here, but it will be given in the catalogue.

One fact comes out plainly in these studies: that certain characters that are useful for diagnosis in one group may fail in another. This arises from the well-known fact that a character once discarded in the evolution of a group is never revived. Thus we find that the hamus, or vestigial vein, found in the wing-cell

in most of the Phylaria, is apparently always absent in the Orthotylini where it seems to have been discarded, but in the Oncotylaria, which is intermediate between these groups, it may be either present or absent in the same genus, possibly in the same species or individual.

The characters of the arolia present a similar case. Their form seems to be constant for each tribe but in any, at least of the larger ones, it may be entirely absent in certain genera. I would not, however, consider the arolia a vestigial character as is the hamus in the wing-cell.

In these keys I have attempted to arrange the tribes and genera in what seems to me to be the correct descending order, but here there certainly is a large field for investigation and many changes will probably have to be made. The claspers, or genital hooks, of the male form excellent specific characters in many cases, but there are groups of species here and there in which these hooks exhibit scarcely any appreciable differences between what are undoubtedly good species.

The following are the eight genera omitted from the keys: *Neocapsus* Dist., *Pallacocoris* Reut., *Neoborops* Uhler, *Eccritotarsus* Stal, *Teleorhinus* Uhler, *Cyllocoris* Hahn, *Orthocephalus* Fieb., *Microsynamma* Fieb.

As a matter of convenience the following terms are explained here.

Arolia.—The pulvillae between the base of the tarsal claws, sometimes free, sometimes united with the claws beneath.

Bucculae.—A narrow plate lying either side of the base of the rostrum; rarely used in the Capsidae.

Callosities.—A more or less elevated area on either side of the anterior lobe of the pronotum, usually distinguished by an impressed bounding line, at least posteriorly.

Cheeks or *gena*.—The two sclerites below the eyes and between the clypeus and gula. Between them is frequently a narrow segment called the *lora*. The inner or upper cheeks may be nearly flat or at times considerably elevated or tumid.

Clavus.—The inner area of the elytra next to the scutellum and separated from the corium by the claval suture. It is usually long-triangular in form, with its apex near the base of the membrane.

Clypeus or *tylus*.—The median lobe of the head below the front and reaching to the base of the rostrum.

Collar or *collum*.—The narrow anterior margin of the pronotum. Generally separated from the disk of the pronotum by an impressed line which may or may not be continued over the side.

Corium.—The main portion of the elytra lying exterior to the clavus; its outer margin being formed by the costa.

Cuneus.—A triangular piece, joined by a suture to the apex of the corium.

Facial angle.—The angle between the line of the bucculae and that of the clypeus when viewed from the side.

Fracture.—The notch between the apex of the corium and the base of the cuneus on the costal margin of the elytra.

Front.—The front of the head between the eyes, below the vertex and above the clypeus.

Gula.—The throat, or lower surface of the base of the head lying beneath the rostrum.

Lorae.—The narrow segment lying between the upper and lower cheeks at the base of the rostrum.

Membrane.—The membranous apical portion of the elytra. It carries a looped nervure at base forming one large areole and usually a second smaller one next the apex of the cuneus.

Scutellum.—The basal lobe is usually convex and separated from the apical by a suture. This basal lobe is often more or less covered by the base of the pronotum and in using this character allowance must be made for the depression of the pronotum.

Tylus.—Same as clypeus.

Vertex.—The basal portion of the superior surface of the head between the eyes. It merges insensibly into the base of the front.

Vestiture.—The covering of hairs on the surface of the body. These hairs may be soft or stiff, or they may be flattened and scale-like, and are often deciduous and very easily rubbed off.

Xyphus (prosternal).—The triangular piece on the prosternum between the bases of the anterior coxae.

In the Phylaria three new genera have been established for which there are as yet no described species, and they are therefore invalid here, but they will soon be validated by the publication of species. These genera are: *Leptotylus*, *Oligotylus*, and *Strophopoda*. One hundred and twenty-five genera are treated of here which, with the eight omitted genera, make a total of one hundred and thirty-three genera recorded from America north of Mexico.

The following is a fairly close translation of Reuter's key to his subfamilies of 1910:

- 1 (16). Membrane biareolate, or with one areole distinctly dilated at apex, very rarely without an areole but with several irregular longitudinal veins more or less distinct. Elytra with a distinct cuneus which very rarely becomes confluent with the corium.
- 2 (3). Arolia large, free, approximate at base between the claws, toward their apex very distinctly divaricate and frequently dilated.

3 (2). Arolia differently formed or wanting.

4 (5). Membrane distinctly pilose. Claws destitute of arolia.

8. Bothynotinae

5 (4). Membrane glabrous.

6 (7). Pronotum without a collar, but with its apical area gibbous-convex, anteriorly frequently more or less produced above the vertex; always roundedly produced posteriorly but not surpassing the sides, the lateral margins attaining the apical. Arolia short, united to the claws or wanting. First tarsal joint longer than the second.

6. Ambraciinae

7 (6). Pronotum with or without apical collar; destitute of a gibbous posteriorly rounded apical area.

8 (9). Arolia wanting. First joint of hind tarsi long or very long, rarely not longer than the second. Tibiae frequently mutic and very distinctly more slender toward its apex. Wing-cell with the hamus wanting or very rudimentary.

7. Cylapinae

9 (8). Arolia present, rarely wanting, in this case with the first joint of the tarsi short, or the wing-cell with a distinct hamus, or the body constricted at the middle. First joint of the tarsi very rarely long, in this case the cell of the wing with a hamus or the arolia present. Tibia very attenuated toward its apex.

10 (11). Apical joint of the tarsi more or less distinctly incrassate, rarely sublinear. Arolia laminate, rarely short, frequently large, always approximate to or connate with the claws. Tibiae always destitute of spines. Lorae confluent with the cheeks. Cell of the wings without a hamus.

5. Bryocorinae

11 (10). Apical joint of the tarsi linear, rarely a little thicker toward its apex, in this case the arolia free and connivent at apex. Tibiae frequently distinctly spinose.

12 (13). Prothorax with an annular collar at apex, in brachypterous females sometimes obsolete above in the middle. Arolia none, or with the arolia varying in length and closely approximated to the claws with which they are connate, at least at base, frequently for their whole length. Lorae linear, well distinguished on either side.

4. Macrolophinae

13 (12). Prothorax without an apical collar, sometimes with the apical margin slenderly depressed, in this case with the arolia free and connivent at apex.

14 (15). Arolia free, slender, parallel or connivent at apex, very rarely none, in this case the wing-cell destitute of a hamus, or the body constricted at the middle, or the last two joints of the antennae thicker than the others.

3. Heterotominae

15 (14). Arolia connate with the claws, very rarely free, in this case closely approximated to them, sometimes expanded at apex with the claws minute, falciform; frequently narrowly laminate, rarely none, in this case the wing-cell furnished with a hamus.

2. Phylinae

- 16 (1). Membrane with but one areole, the vein mostly parallel with the suture. Elytra destitute of an embolium and cuneus. Prothorax without an apical stricture. First tarsal joint long. Arolia none. **1. Lygaeoscytinae**

Of these, the subfamily Lygaeoscytinae is Australian; the subfamily Bothynotinae is confined to the Old World; the subfamily Phylinae is equivalent in our fauna to my Phylini, Bryocorinae to my Bryocorini, and Cylapinae to my Cylapini. Reuter's subfamily Heterotominae is the same as my Orthotylini, but his typical division Heterotomaria was first founded as Litosomidae by Douglas and Scott in 1865; but their genus *Litosoma* being a straight synonym of *Orthotylus* Fieb., the tribe, or division of Reuter, must be called Orthotylini and the subfamily Orthotylinae. Reuter's Macrolophinae embrace my Dicyphini (Macrolopharia Kirk., 1906 is antedated by Idolocoridae Dougl. and Scott, 1865, the typical genus *Idolocoris* Dougl. and Scott, 1865, being a synonym of *Dicyphus* Stal, 1858), and my Hallodapini which is equivalent to Cremnocephalaria Reut. (first established as Eroticoridae Dougl. and Scott, 1865, the typical genus *Eroticoris* Dougl. and Scott being a synonym of *Hallodapus* Fieb., 1858). Lastly Reuter's Mirinae include my Myrini, Capsini and Horistini; the latter, termed Restheniaria by Reuter, was first distinguished as Lopidae by Douglas and Scott in 1865, their *Lopus* being equivalent to *Horistus* Fieb., 1861. It will be noticed that Reuter has entirely ignored the work of Douglas and Scott, who were the first to break up the great family Capsidae into smaller divisions. That their divisions were sometimes made too limited in scope and were termed families is no reason for ignoring them entirely. Reuter uses the termination *-ina* for his subfamilies, which I have changed to *-inae* to make them conform to modern usage.

KEY TO THE TRIBES

- Apical margin of pronotum without a collar, swollen or elevated in a hood above the base of the vertex **Clivinemini**
 Apical margin of pronotum not swollen or elevated in a hood above the base of the vertex 1
 1. Third tarsal joint thickened toward its apex; membrane in our genera uniareolate **Bryocorini**
 — Third tarsal joint linear, or nearly so 2

2. Pronotum with a distinct apical collar, or with a flattened anterior margin simulating a collar 3
- Pronotum without a collar 9
3. Pronotal collar convex, separated from anterior disk by a distinct incised line 4
- Pronotal collar flat, without an incised line behind it, or wanting; body elongated, often linear 8
4. Head viewed from above short, vertical, produced below the eye for nearly twice the length of the eye; antennae long and slender, much longer than the entire body, inserted the length of the clypeus above its base; basal joint of the tarsi as long as the following two together; arolia wanting; vertex deeply sulcate; pronotal collar very slender **Cylapini**
- Head not greatly produced below the eye; antennae rarely longer than the entire body, inserted about on the line of the base of the clypeus; basal joint of the tarsi shorter than the following two taken together 5
5. Rostrum long, passing the middle of the venter; head produced, horizontal or nearly so; tibiae smooth, or with minute pubescence only; tarsi slender, basal point but little shorter than the following two together; arolia wanting **Fulvini**
- Rostrum shorter, scarcely surpassing the hind coxae; tibiae armed with bristles or clothed with longer hair, rarely smooth 6
6. Pronotal collar broad, convex, about as broad as the callosities; tibiae thickly clothed with soft hairs but without rows of stouter bristles; body opaque, black, marked with red or fulvous..... **Horistini**
- Pronotal collar narrow, convex, often linear, rarely broad; then flat with the body elongated, tibiae smooth and pronotum broadest before the middle 7
7. Body elongated, often linear; base of scutellum usually exposed; tibiae smooth or nearly so; arolia minute and united with base of the claws, or as long as the claws and lying close to them..... **Dicyphini**
- Body rarely elongated, with the base of scutellum exposed and tibiae smooth or nearly so, arolia in this case free and divergent at apex **Capsini**
8. Tarsi long, first joint longer than the following two together; pronotal collar a mere flattening of the anterior margin, or sometimes wanting; vertex often sulcate; arolia large, free, often clavate..... **Mirini**
- Tarsi shorter, first joint not longer than the third, usually shorter, pronotal collar often wanting; arolia united with the claws or wanting **Hallodapini**
9. Arolia free, parallel, or converging toward their tips; wing-cell without a hamus **Orthotylini**
- Arolia wanting, or parallel with and usually united to the claws at base, wing-cell normally with a hamus..... **Phylini**

KEYS TO THE GENERA

TRIBE MIRINI Douglas and Scott

- Head exserted, distinctly narrowed behind the eyes, which are not contiguous to the anterior angles of pronotum; pronotum with a distinct collar 1
- Head not obviously exserted, eyes contiguous to the anterior angles of pronotum, or nearly so 2
1. Head strongly exserted, eyes being located at about the middle; median sulcus of the vertex short but distinct.....**1. Collaria** Prov.
- Head little exserted, eyes being located near to the hind margin of the head but distinctly separated from the anterior angles of pronotum; vertex transversely depressed between the eyes, median sulcus nearly or quite obsolete**2. Miris** Fabr.
2. Base of pronotum truncated or a little emarginate at the middle..... 3
- Base of pronotum concavely arcuated, leaving the base of scutellum broadly exposed 5
3. Basal lobe of scutellum covered by pronotum.....**3. Stenodema** Lap.
- Basal lobe of scutellum exposed 4
4. Body narrow, elongated; head one-third longer than broad, nearly or quite as long as the pronotum**4. Megaloceraea** Fieb.
- Body more ovate; head short, not longer than broad, much shorter than the pronotum**5. Mesomiris** Reut.
5. Large areole of the membrane entirely hyaline; head long and pointed, with the median sulcus deep **6. Trigonotylus** Fieb.
- Large areole of the membrane, or at least its outer half, opaque punctate; head short, transversely flattened at base, median sulcus obsolete, or nearly so**7. Teratocoris** Fieb.

TRIBE HORISTINI n.n.

- Head short, vertical, when viewed from the side nearly square at apex, gula almost obliterated; elytra parallel, or the costa regularly and feebly arcuated; second joint of hind tarsi not more than half the length of the first 1
- Head a little oblique, when viewed from the side distinctly produced and narrowed toward the apex, gula quite long, oblique; elytra considerably expanded beyond the middle; second joint of hind tarsi nearly or quite as long as the first**2. Opisthuria** Reut.
1. Vertex and front more or less convex, front not at all tumidly projecting before the clypeus; sides of pronotum anteriorly carinate only across the incisure separating the collum.....**1. Platytylellus** Reut.
- Front tumid, projecting prominently before the base of the clypeus; pronotal margins anteriorly carinate to behind the callosities **3. Oncerometopus** Reut.

TRIBE CAPSINI Reuter

KEY TO THE DIVISIONS

- Body linear, constricted at the middle; pronotum swollen at its middle and as wide there, or wider, than on hind margin.....**1. Myrmecoraria**

- Body rarely linear and constricted at the middle, pronotum in this case widest behind 1
1. Arolia free, divergent, usually more or less curved and clavate 2
- Arolia absent, their place taken by two parallel setae; membrane often uniareolate; body robust, polished 5. **Deraeocoraria**
2. Body above impunctate, or with fine aciculate punctures only 3
- Body above, or at least the pronotum, coarsely distinctly punctate, polished, callosities prominent 4. **Capsaria**
3. Form more elongate, parallel or subparallel, cuneus at most but slightly depressed and the fracture small 2. **Phytocoraria**
- Form more ovate, elytra more distinctly convex, the cuneus strongly deflexed and the fracture deep 3. **Dichrooscytaria**

DIVISION 1. MYRMECORARIA Reut.

- Head constricted into a short neck behind the eyes; clypeus prominent, convex, its base distinct from the front; pronotal collar with a distinct incised line behind 1. **Mimoceps** Uhl.
- Head not constricted behind the eyes; clypeus depressed, merged with the front; stricture of pronotal collar evenescent at its middle 2. **Pithanus** Fieb.

DIVISION 2. PHYTCORARIA Reut.

- Body above opaque and impunctate 1
- Body above more or less distinctly polished, sometimes shagreened or aciculate-punctate and almost opaque 4
1. Form linear, constricted at the middle; pronotum produced, almost cylindrical before; vertex sulcate 1. **Paraxenetus** Reut.
- Body not constricted at the middle, pronotum trapezoidal; vertex not obviously sulcate 2
2. First antennal joint thickened and clothed with flattened hairs 2. **Neurocolpus** Reut.
- First antennal joint without flattened hairs 3
3. Hind femora linear, terete or nearly so 4. **Ecertobia** Reut.
- Hind femora ligulate, flattened, broadest near the base and tapering from middle to apex 3. **Phytocoris** Fall.
4. Head not or scarcely vertical, when viewed from the side distinctly narrowed below antennae; gula oblique 5
- Head vertical, thick and cylindrical below antennae; gula nearly or quite parallel with tylus 10
5. Second antennal joint strongly clavate, fusiform, more tapering toward base 10. **Garganus** Stal.
- Second antennal joint sometimes moderately thickened but not strongly clavate 6
6. Vertex not sulcate at base 7
- Vertex sulcate at base 8
7. First joint of hind tarsi shorter than the second 9. **Ganocapsus** Van D.
- First joint of hind tarsi much longer than the second 8. **Stenotus** Reut.

- 8. Face opaque, distinctly obliquely striate; sulcus conspicuous; clypeus not at all polished; callosities inconspicuous.....5. **Creontiades** Dist.
- Face polished, without distinct striae; sulcus inconspicuous; clypeus polished; callosities conspicuous 9
- 9. Sides of pronotum carinate; collar broad; head subhorizontal; eyes small, oblique 6. **Allorhinocoris** Reut.
- Sides of pronotum ecarinate, rounded; collar very slender; head nearly vertical and thick at apex, extending but little below the large vertical eyes 7. **Adelphocoris** Reut.
- 10. Second antennal joint clavate, clavate portion occupying the apical third and strongly flattened and sulcate above; vertex without a sulcus; surface polished, nude 11. **Ectopiocerus** Uhler
- Second antennal joint linear, not at all clavate; surface above clothed with a close pubescence 11
- 11. Whole upper surface closely, minutely shagreened, giving the insect an opaque aspect; vertex sulcate at base; antennae inserted much below the eyes 13. **Thyrillus** Uhler
- Upper surface more polished; base of vertex with a transverse groove but scarcely prolonged at the middle in a sulcus; antennae inserted close against the lower angle of the eyes 12. **Irbisia** Reut.

DIVISION 3. DICHROOSCYTARIA Douglas and Scott

- Upper surface opaque or nearly so, clothed with short pubescence 1
- Upper surface highly polished, nude; form broad-ovate; cuneus strongly deflexed 6
- 1. Pronotum marked with a pair of round black points, occasionally wanting in specimens not fully colored 2
- Pronotum without the pair of round black points 4
- 2. Basal joint of antennae terete, or nearly so 3
- Basal joint of antennae strongly compressed, nearly as wide as hind femora 2. **Lampethusa** Dist.
- 3. Second antennal joint linear; first joint with but few minute hairs, not, or scarcely, longer than the head 4. **Calocoris** Fieb.
- Second antennal joint thickened toward the apex; first joint densely pubescent, hairs nearly or quite as long as the thickness of the joint 3. **Paracalocoris** Dist.
- 4. Antennae stout, second joint strongly clavate, third and fourth abruptly slender and together scarcely longer than the first; body broad oval, densely sericeous-pubescent; scutellum tumid.... 1. **Pycnocoris** Van D.
- Antennae slender, second joint linear, third and fourth joints together nearly or quite as long as the second 5
- 5. Head exserted, the small rounded eyes not overlapping pronotal angles; base of clypeus when viewed from above much anterior to the insertion of antennae 5. **Poeciloscytus** Fieb.
- Head broad and short, closely set against pronotum, the large eyes overlapping its anterior angles; base of clypeus when viewed from above in a line with base of antennae 6. **Dichrooscytus** Fieb.

6. Rostrum long, reaching at least to intermediate coxae; pronotum with obscure scattering impressed points, but not at all punctate 7. **Horcias** Dist.
- Rostrum short, not surpassing anterior coxae; pronotum obscurely punctured 8. **Poecilocapsus** Reut.

DIVISION 4. CAPSARIA Reut.

- Vertex sulcate and transversely striate; second joint of hind tarsi much shorter than first and third 4. **Platylygus** Van D.
- Vertex more or less polished, scarcely striate or sulcate; first and second tarsal joints subequal 1
1. Elytra nearly flat, cuneus at most but moderately deflexed 2
- Elytra more convex, cuneus much deflexed and the fracture deep..... 6
2. First and second antennal joints rather thick, the second linear and scarcely thinner than the first, or in the female slightly attenuated at base and apex 3
- Second antennal joint more or less distinctly thickened toward its apex; sometimes sublinear but then distinctly thinner than joint one 4
3. Base of vertex flattened, hind margin carinate; base of scutellum but little exposed; elytra oblong, parallel 3. **Lygidea** Reut.
- Vertex convex, polished, its base ecarinate; base of scutellum broadly exposed; body oval, distinctly broader behind the middle; color red 2. **Coccobaphes** Uhl.
4. Third and fourth antennal joints abruptly thinner and together scarcely more than half the length of the second joint, which is linear and moderately thickened but thinner than first 6. **Tropidostepes** Uhl.
- Antennae slender, third and fourth joints setaceous and together at least two-thirds the length of the second 5
5. Form more ovate; sides of the pronotum carinate..... 7. **Neoborus** Dist.
- Form more elongated and subparallel; sides of the pronotum ecarinate 8. **Xenoborus** Reut.
6. Inner cheeks tumidly convex, forming almost a tubercle beyond base of antennae; second antennal joint clavate; pronotum coarsely punctured; head broad behind and concentric with the anterior margin of pronotum 1. **Capsus** Linn.
- Inner cheeks convex but not prominently tumid; second antennal joint but little thicker at apex; pronotum more finely punctured; eyes rounded behind, head not concentric with the anterior margin of pronotum 5. **Lygus** Hahn.

DIVISION 5. DERAECORARIA Douglas and Scott

- Vertex transversely striate and longitudinally sulcate; second joint of hind tarsi much shorter than first and third 1
- Vertex more or less polished, scarcely striate or sulcate; first and second tarsal joints subequal 2

1. Second antennal joint clavate; third and fourth short and thick, fusiform; prosternal xyphus convex, but slenderly margined 2. **Diplozona** Van D.
- Antennae linear, of nearly equal thickness throughout; second joint scarcely enlarged at apex, third and fourth linear.....1. **Cimatlan** Dist.
2. Elytra punctate, not bullate behind; basal joint of hind tarsi not produced below beyond the second 3
- Elytra impunctate, bullate behind, cuneus almost vertical; basal joint of hind tarsi thickened, oblique at apex and attaining the apex of second joint; head nearly vertical, but little produced before the eyes 4. **Klopicoris** Van D.
3. Head strongly produced and nearly horizontal, surpassing apex of short first antennal joint; second antennal joint thick and very long, nearly linear, longer than the remaining three joints taken together; sides of pronotum ecarinate 3. **Eurychlopterella** Reut.
- Head less produced, not surpassing middle of basal antennal joint..... 4
4. Sides of pronotum carinate, antennae rather short and slender, apex of the second joint distinctly thickened; membrane often uniareolate; xyphus sometimes convex on the middle 5. **Camptobrochis** Fieb.
- Sides of the pronotum ecarinate; antennae longer, basal two joints stout, the first surpassing the apex of the head by two-thirds its length, second a little thicker apically.....6. **Deraeocoris** Kirschb.

TRIBE BRYOCORINI Douglas and Scott

- Form oblong, more or less elongated, elytra parallel or subparallel..... 1
- Form shorter, ovate or subovate 4
1. Eyes on a suberect stylus which is at least as long as the width of the eye 9. **Hesperolabops** Kirk.
 - Eyes sessil, or at most but substylate 2
 2. Eyes large, exerted or substylate; callosities convex, oblique, contiguous at middle of pronotum, leaving a transverse triangular punctured area before 8. **Caulatops** Bergr.
 - Eyes smaller, not at all stylate; callosities more transverse, not contiguous at middle of pronotum 3
 3. Body opaque, pubescent; second joint of antennae long, about equaling basal width of pronotum 7. **Dacota** Uhl.
 - Body smooth, more or less polished; second joint of antennae short, not longer than width of head 6. **Sysinas** Dist.
 4. Pronotum with a prominent linear collar 5. **Monolocoris** Dahlb.
 - Pronotum without a distinct collar 5
 5. Scutellum without a triangular discal impression 6
 - Scutellum with a triangular discal impression 7
 6. Embolium broadly expanded, about as wide as hind femora; pronotum strongly convex and bullate behind, with three longitudinal impressions 4. **Pycnoderes** Guer.
 - Embolium linear; pronotum convex but not at all bullate or longitudinally impressed behind 3. **Sixeonotus** Reut.

7. Antennae inserted close to apex of the eye, basal joint very short, one-third shorter than width of front 2. *Halticotoma* Reut.
 — Antennae inserted some distance above apex of the eye, last joint considerably longer than width of vertex and much surpassing clypeus 1. *Cyrtocapsus* Stal.

TRIBE CLIVINEMI Reuter

- Second antennal joint linear; sides of pronotum without a distinct carina 1. *Clivinema* Reut.
 Second antennal joint stout, clavate, apical two short and abruptly slender; sides of pronotum distinctly carinated 2. *Largidea* Van D.

TRIBE CYLAPINI Reuter

- Form oval; head short, vertical; vertex with a deep longitudinal impression; antennae very long and slender, much surpassing tip of membrane; basal joint thickened, fusiform 1. *Cylapus* Say

TRIBE FULVINI Uhler

- Body elongated; costa but feebly arcuate; sides of pronotum concavely arcuate, humeral angles prominent 1. *Fulvius* Stal.
 Body broad-oval; costa strongly arcuate; sides of pronotum not at all concavely arcuate, humeri not prominent 2. *Peritropis* Uhler

TRIBE HALLODAPINI n.n.

- Tarsal claws with arolia minute or wanting 1
 Tarsal claws with long parallel arolia; females sometimes wingless, formiciform 5
 1. Hind margin of pronotum with a median spine, behind which the edge is notched 1. *Dacerla* Sign.
 — Hind margin of pronotum without spine or notch 2
 2. Head short, vertical, but little produced below the eyes 3
 — Head long, oblique, produced below the eyes for a distance nearly as great as the length of the eye 4
 3. Posterior lobe of scutellum tumidly elevated....2. *Cyrtopeltocoris* Reut.
 — Posterior lobe of scutellum transversely moderately convex, horizontal 3. *Sericophanes* Reut.
 4. Posterior lobe of scutellum moderately convex, subearinate; sides of pronotum almost rectilinear, a little curved outward at the humeri 4. *Closterocoris* Uhler
 — Posterior lobe of scutellum tumidly elevated, subconical, as high as base of pronotum 5. *Cyphopelta* Van D.
 5. Second antennal joint clavate 6. *Orectoderus* Uhler
 — Second antennal joint linear 7. *Coquillettia* Uhler

TRIBE DICYPHINI Reuter

- Hind margin of pronotum rectilinear, or slightly concavely arcuate; head vertical before, when viewed from the side not projecting before eyes; hind margin of callosities located considerably before the middle of the pronotum 1. *Hyaliodes* Reut.

- Hind margin of pronotum concavely arcuate, leaving base of scutellum exposed; head sometimes nearly vertical but then narrowly but distinctly surpassing front line of eyes; hind margin of callosities nearly or quite attaining middle of pronotum 1
1. Head when viewed from the side distinctly produced and oblique; angle of face (angle of tylus and bucculae) subacute; eyes small and oblique, placed at middle of the head 4. **Macrolophus** Fieb.
- Head vertical or nearly so; apex of head truncated, facial angle a right angle; eyes large and vertical 2
2. Head produced in a distinct neck behind eyes, space behind the eye when viewed from the side about as long as width of the eye 2. **Dicyphus** Fieb.
- Head scarcely produced behind the eye, forming but a very slender margin there of about the width of pronotal collum 3. **Engytatus** Reut.

TRIBE ORTHOTYLINI n.n.

KEY TO THE DIVISIONS

- Head broad with eyes stylate, their inner margins being beyond the pronotal angles 1. **Laboparia** Reut.
- Head sometimes broad but eyes not at all stylate 1
1. Head broad, hind margin sharp, concentric with or overlapping anterior margin of pronotum 2
- Head not unusually broad, not concentric with or overlapping anterior margin of pronotum; eyes rounded behind 3
2. Form broad-oval; hind femora often broad, saltatorial; clypeus distinct from the front 2. **Halticaria** Kirk.
- Form elongated, body often constricted at the middle; hind femora normal; clypeus depressed and fused with the front 3. **Pilophoraria** Reut.
3. Apical two joints of antennae not thinner than the second 4. **Ceratocapsaria** n.n.
- Apical two joints of antennae abruptly thinner than the second, setaceous, or nearly so 4
4. Base of vertex and sides of pronotum sharply carinate; anterior margin of pronotum sometimes distinctly elevated in a ridge by a transverse depression before callosities; body opaque...5. **Lopidearia** n.n.
- Base of vertex and sides of pronotum sometimes more or less carinate; anterior margin of pronotum in this case not at all elevated 6. **Orthotylaria** n.n.

DIVISION 1 LABOPARIA Reut.

- But one North American genus**Labops** Burm.

DIVISION 2. HALTICARIA Reut.

- Antennae long, setaceous, as long as entire body; hind femora greatly flattened, saltatorial 1. **Halticus** Hahn.
- Antennae scarcely longer than elytra; hind femora not greatly widened nor saltatorial 2. **Strongylocoris** Blanch.

DIVISION 3. PILOPHORARIA Reut.

- Head with eyes little wider than anterior margin of pronotum; sides of pronotum not arcuated; body not constricted at the middle; upper surface ornamented with dots of silvery hairs 1. **Heterocordylus** Fieb.
- Head much wider than anterior margin of pronotum; sides of pronotum arcuate; body constricted at the middle; elytra sometimes with transverse lines of silvery hairs 1
1. Second antennal joint distinctly clavate; body constricted at the middle; elytra usually ornamented with transverse lines of pale scale-like hairs 2. **Pilophorus** Hahn.
- Second antennal joint almost linear; body scarcely constricted at the middle; elytra without transverse lines of scale-like hairs 3. **Alepidia** Reut.

DIVISION 4. CERATOCAPSARIA n.n.

- Pronotum anterior to the middle nearly cylindrical, then rather abruptly flaring to the humeri; elytra sparsely clothed with long hairs 1. **Pamilia** Uhl.
- Pronotum regularly narrowing anteriorly, its sides not constricted at the middle 1
1. Elytra parallel; head vertical 2. **Tiryas** Kirk.
- Elytra with costa more or less arcuate; head obviously oblique 3. **Ceratocapsus** Reut.

DIVISION 5. LOPIDEARIA n.n.

- Vertex prominent, convex, its base strongly carinate across its whole width; anterior edge of pronotum not elevated.... 3. **Hadronema** Uhl.
- Base of vertex carinate only at the middle, carina not reaching the eye, anterior margin of pronotum elevated 1
1. Basal two joints of antennae incrassate, the second narrowed toward its apex and sometimes flattened in males..... 1. **Lomatopleura** Reut.
- Second antennal joint linear or nearly so..... 2. **Lopidea** Uhl.

DIVISION 6. ORTHOTYLARIA Douglas and Scott

- Pronotum constricted behind callosities, constriction continued over the sides, body elongated 1
- Pronotal stricture if present not continued over the sides 2
1. Posterior coxae distant; basal joint of antennae a little longer than head; pronotum with a collar-like constriction 1. **Pseudoxenetus** Dist.
- Posterior coxae contiguous; basal joint of antennae short, scarcely surpassing clypeus 2. **Globiceps** Fieb.
2. Eyes placed near or before the middle of sides of head 3
- Eyes placed on hind margin of head, vertex not continuing around behind the eyes 4
3. Head a little triangularly produced before the eyes; vertex and front together convex, base of the former rounded over and not at all carinate; elytra parallel; membrane biareolate.... 3. **Paraproba** Dist.

- Head truncate before, not produced before eyes; vertex broadly excavated, base arcuated and carinate; elytra broad, the embolium well developed; areoles of membrane merged into one, dividing nervure nearly or quite obsolete, their surface similar in structure to the diaphanous corium and cuneus 4. **Hyalochloria** Reut.
- 4. Eyes rounded behind, in conformity with the curve of the base of the vertex, thus bringing eyes away from pronotal angles; base of vertex ecarinate in the male, very obtusely carinate in the female; elytra ample, flat, subhyaline 5. **Diaphnidia** Uhl.
- Hind margin of vertex and eyes forming nearly or quite a straight line, thus bringing eyes into proximity to pronotal angles 5
- 5. Tender whitish insects with elytra a little wider than humeri; basal joint of antennae lineate with black exteriorly; vertex ecarinate. 6. **Reuteria** Put.
- Sometimes tender and whitish, then with vertex carinate at base and first antennal joint without a black line 6
- 6. Vertex with a distinct carina at base behind a transverse impression, this impressed area sometimes with a foveate dot on either side.... 7
- Vertex without a distinct basal carina; sometimes tumid at base, simulating an obtuse carina, with surface before it broadly triangularly depressed 8
- 7. Head viewed from the side short, apex never produced the length of the eye below its lower angle; pronotum without a round black spot behind callosities 7. **Orthotylus** Fieb.
- Head viewed from the side longer, apex produced at least the length of the eye below its lower angle; pronotum with an impressed round spot behind outer angle of callosities.....8. **Ilnacora** Reut.
- 8. Head vertical, with an oblique impression either side on vertex; clypeus prominent, convex, well distinguished at base; body above smooth, clothed with deciduous black hairs and minute silvery scale-like hairs (type *Macrotylus angularis* Uhl).....11. **Pseudopsallus** n. gen.
- Vertex without an oblique impression at base 9
- 9 Pronotum with its base elevated above base of scutellum, strongly declinate anteriorly, its vertical height about equal to that of head; basal two joints of antennae flattened; body opaque, hirsute, elytra marked with black and white 9. **Semium** Reut.
- Pronotum not greatly raised above base of vertex and little above the level of scutellum; antennae not flattened 10
- 10. Hind femora normal, not saltatorial 11
- Hind femora very broad (nearly one-third its length), saltatorial; head short, vertical; vertex ecarinate; basal antennal joint short, scarcely surpassing apex of tylus 15. **Parthenicus** Reut.
- 11. Head transverse, vertical, viewed from above not projecting before eyes; pronotum campanulate, humeri prominent; males with their second antennal joints clavate.....10. **Mecomma** Fieb.
- Head viewed from above angularly produced before the line of the eyes; pronotum trapezoidal, humeri not abruptly prominent; antennae never clavate 12

12. Head vertical; dimorphic, females ovate, with eyes strongly arcuated and membrane abbreviated, males with elytra parallel; green or green and black insects 12. **Labopidea** Uhl.
 — Head oblique, produced before eyes for about length of eye 13
 13. Large green ovate species, with the body narrowed before and behind, tylus moderately produced; rostrum reaching to middle of venter (type *Macrotylus vestitus* Uhl.).....13. **Macrotyloides** n. gen.
 — Smaller and more slender species, with the body linear; tylus compressed and semicircularly prominent, occupying about half the length of head beyond apex of eyes 14. **Argyrocoris** Van D.

TRIBE PHYLINI Douglas and Scott

- Prosternal xyphus depressed on its disk, its margin more or less elevated; arolia rather long and flattened, usually united with the claws
Division 1. **Oncotylaria** Reut.
 Prosternal xyphus convex, immarginate; arolia short and united with the claws or wanting.....Division 2. **Phylaria** D. and S.

DIVISION 1. ONCOTYLARIA Reut.

- Tarsal claws short and strongly incurved; arolia free, laminate, as long as the claws; clypeus prominent, viewed from the side strongly curved 1. **Macrotylus** Fieb.
 Tarsal claws longer, nearly straight, or somewhat curved toward their apex 1
 1. Head long, rostrate-produced, when viewed from the side projecting before the eye for about twice the length of the eye; prosternal xyphus sometimes moderately convex, but a distinct marginal carina can be seen when vestiture is removed; body broad, ovate, much narrowed before; surface clothed with a fine whitish vestiture intermixed with stiff black hairs 2. **Haplomachidea** Reut.
 — Head not produced before the eye for more than length of the eye; body oblong or elongated, clothed with a minute or uniform vestiture 2
 2. Clypeus prominent, its base but poorly distinguished from the front, placed much above the line of antennae; basal lobe of scutellum much exposed; arolia long, exceeding apex of claws, with which they are united for their whole length.....3. **Onychmenus** Reut.
 — Clypeus moderately prominent, its base well distinguished from the front and placed a little above the line of antennae; base of pronotum rectilinear, leaving basal lobe of scutellum but narrowly exposed; arolia slender, becoming free toward their apex and surpassing the middle of the claws.....4. **Oncotylus** Fieb.

DIVISION 2. PHYLARIA Douglas and Scott

- Head more or less produced; when viewed from the side having facial angle (between bucculae and line of clypeus) less than a right angle 1

- Head not or scarcely produced, when viewed from the side having the facial angle nearly or quite a right angle 10
1. Clypeus broad, depressed; first antennal joint not or scarcely surpassing clypeus 3. *Sthenarus* Fieb.
- Clypeus prominent, convex 2
2. Femora black or pale and dotted in longitudinal series; rarely pale without dots, then with tibiae dotted and marked with a darker or black spot at base 3
- Femora pale and irregularly dotted with darker or black; often without dots, then with tibiae pale without black points 7
3. Head rostrate-produced, projecting before the eye for a distance much greater than length of eye; second antennal joint broadly flattened in the male; femora black 5. *Criocoris* Fieb.
- Head not produced before the eye for a space greater than width of the eye; second antennal joint linear in both sexes 4
4. Femora black; body above conspicuously clothed with white hairs. 10. *Apocremnus* Fieb.
- Femora pale, dotted in longitudinal series; rarely black, then the body above with a fine pale pubescence only 5
5. Tibiae dotted; antennae with second joint uniformly colored, or if partly colored paler at middle or apex 6
- Tibiae pale without dots, bristles only dark; femoral dots sometimes obsolete above; antennae with second joint black on apical half. 7. *Rhinocapsus* Uhl.
6. General color of whole body red or reddish-brown 8. *Gerhardiella* Popp.
- General color pale, whitish or tinged with yellow, marked more or less with fuscous or black areas, sometimes entirely black 9. *Plagiognathus* Fieb.
7. Femora pale and irregularly dotted, at least below.....2. *Psallus* Fieb.
- Femora pale without dots 8
8. Color uniformly black or nearly black above, legs pale 9
- Color pale, more or less marked with fuscous or black above 1. *Reuteroscopus* Kirk.
9. First antennal joint surpassing clypeus by more than half its length; body polished and nude above 6. *Microphylellus* Reut.
- First antennal joint scarcely surpassing apex of clypeus; body above clothed with pale pubescence 4. *Leptotylus* n. gen.
10. Vertex distinctly carinate at base; rostrum short, but little surpassing the anterior coxae 15. *Myochroocoris* Reut.
- Vertex without a basal carina; rostrum longer 11
11. Second antennal joint linear, neither clavate nor flattened 12
- Second antennal joint clavate or flattened and broader than first joint 21
12. Clypeus well distinguished from the front by an incised suture 13
- Clypeus confused with the front or with suture very obscure; size small (2-3 mm.) 17

13. Hind femora not at all saltatorial, not wider than the eye viewed from the side, pale, dotted in longitudinal series; tibial bristles black and inserted in black points; first joint of rostrum scarcely attaining base of head 14
- Hind femora saltatorial, much thickened or flattened, distinctly wider than lateral width of the eye 15
14. Head broad, its width three-fourths that of hind margin of pronotum; viewed from the side produced below the eye for a distance as great as length of eye 12. *Bolteria* Uhl.
- Head narrower, hardly more than half as broad as basal width of the pronotum; viewed from the side shorter, produced below the eye for hardly more than half length of the eye; body densely clothed with white deciduous hairs 11. *Oligotylus* n. gen.
15. Femora black, tarsi annulated with white; body small, black 20. *Strophopoda* n. gen.
- Femora pale, dotted with fuscous or black points 16
16. Base of clypeus on a line with the insertion of antennae 16. *Atomoscelis* Reut.
- Base of clypeus above line connecting base of antennae 17. *Europiella* Reut.
17. Third joint of hind tarsi as long as first and second together; arolia short, linear; attached to base of claws.....18. *Tuponia* Reut.
- Third joint of hind tarsi subequal to second, or shorter 18
18. Head broad, about one-fifth narrower than hind margin of pronotum; body black, hind femora black 19. *Chlamydatus* Curt.
- Head narrower; body, including legs, pale 19
19. Head viewed from the side forming a squarish projection below the eyes; legs and antennae pale, immaculate; tibial spines black; body pale, clothed with short, thick black hair...23. *Maurodactylus* Reut.
- Head forming a very short angular projection below the eyes.....20
20. Legs pale, femora immaculate; second antennal joint annulate with black 22. *Cylloceps* Uhl.
- Legs pale, hind femora dotted with black; first antennal joint annulate with black 21. *Campylomma* Fieb.
21. Second antennal joint terete, but little thickened at apex, longer than third and fourth together 24. *Rhinacloa* Reut.
- Second antennal joint of the male broadly flattened 22
22. Body black, elytra pale brown, bifasciate with white 14. *Leucopoecila* Reut.
- Body entirely blue-black, or only coxae pale.....13. *Atractotomus* Fieb.

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ENTOMOLOGY

Vol. 1, No. 4, pp. 217-227

March 3, 1916

NEW OR LITTLE KNOWN GENERA AND
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(HEMIPTERA)

BY

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SPECIES OF ORTHOTYLINI
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***Hyalochloria bella* n. sp.**

Larger than *Orthotylus compsus* Reut. from Jamaica; fulvo-testaceous, elytra white, beautifully varied with clear green blotches. Length 3.5 mm. to tip of membrane.

Head small, vertical. Vertex broad and with base of front much flattened and depressed between the prominent eyes; apex of front convex; clypeus narrow and prominent. Eyes rather large; viewed from the side ovate, reaching two-thirds of the way to gula. Antennae inserted near to and a little above inner angle of the eye; first joint not so long as head, second more than three times longer. Rostrum long, reaching well over base of venter. Elytra ample, costa expanded for the first one-fourth of its length, beyond that subparallel. Bristles of hind tibiae pale and very minute.

Color fulvo-testaceous. Pronotum in fully matured examples yellowish, with about six green blotches on posterior lobe. Scutellum sometimes varied with green. Elytra whitish hyaline, clavus, corium, cuneus and membranal areoles quite regularly blotched with irregular squarish pale green spots. In *compsus* the green is more irregularly distributed and on the membrane is confined to the small areole and the apical half of the larger one. In *bella* there is a series of green points along the costa which is wanting in *compsus*, and, as mentioned above, the size is considerably larger.

Both of these species are intermediate between *Hyalochloria* and *Diaphnidia*, but the short head and excavated vertex would seem to place them nearer to the former, although the elytra are less expanded, with the embolium much less complete.

Described from one male and four female examples taken by me at Alpine, San Diego County, California, in June and July, 1913. It is worth noting here that Mrs. Slosson has taken *Hyalochloria caviceps* Reut. at Biscayne Bay, Florida, thus bringing the typical form of the genus within our territory.

Genus **Labopidea** Uhler

Form oblong in the male, ovate with abbreviated elytra in the female. Color green, sometimes marked with black, and rather densely clothed with pale appressed hairs. Head broad, vertical, with eyes wider than anterior margin of pronotum. Vertex broad, at least three times as wide as eyes, triangularly depressed, this depression really formed by two oblique, impressed vittae, behind which the surface is lower but leaving the hind margin convex and almost carinated across the middle. Front broad and convex in both diameters. Clypeus broad and prominent, its base almost attaining the line of the eyes, sharply distinguished from the front. Antennae rather long, inserted near lower angle of eyes; first joint short, second at least three times longer, third and fourth becoming thinner. Eyes small, prominent, surpassing by nearly their whole width the pronotal angles; viewed from the side short-oval, scarcely reaching to the middle of the side of the head. Pronotum transverse, rather convex, its length about half the basal width, sides strongly oblique, straight, anterior angles well rounded; hind margin depressed, nearly covering basal lobe of scutellum. Elytra well developed in the male; short, with costa strongly arcuated in the female, in which the membrane is frequently reduced to a mere margin. Membrane when developed biareolate. Rostrum scarcely attaining the hind coxae. Arolia free and converging. Wing-cell without a hamus.

Dr. Uhler describes the eyes as almost pedunculate, but that appearance is caused by their rounded, bead-like form when viewed from above, and perhaps in part by the rounded anterior angles of the pronotum. The genus was founded upon a female very like the female of *sericatus*, but somewhat marked with black. The large thick green bodies clothed with a close hoary pubescence, the thick vertical head and the short rounded elytra

of the females will distinguish this genus from *Orthotylus* and its allies. Our species may be distinguished as follows:

Antennae black	1
Antennae pale	2
1. Legs pale, the body beneath mostly pale.....	2. <i>simplex</i> Uhl.
— Legs black, the body beneath mostly black	1. <i>nigripes</i> Reut.
2. Tibial spines slender, pale	3. <i>sericata</i> Uhl.
— Tibial spines stouter, black	4. <i>atriseta</i> n. sp.

1. *Labopidea nigripes* (Reut.)

A large, stout, bluish-green species with minute pale pubescence, and antennae, legs and all beneath black. Male nearly the form of *Ilnacora malina* Uhl., elytra about parallel, with apex of corium almost attaining tip of abdomen; female broad-ovate, widest at base of membrane, tip of membrane scarcely if at all surpassing abdomen. Length 5.5 mm. to tip of membrane.

Head large; vertex broad, nearly four times as wide as the small eyes, hind margin arcuate and somewhat thickened or subcarinate, transverse depression appearing foveate. Front prominent, convex, scarcely polished. Antennae rather long; first joint scarcely as long as head; third two-thirds length of second; fourth short, about one-third length of third. Pronotum short, transverse; callosities small, prominent and distant. Hairs on antennae and legs pale and inconspicuous.

Dextral hook of male genitalia ovate at base, incurved apex narrower but obtuse; sinistral hook broad, convex basally, produced distally, with an acute hook at either angle.

Color uniform bluish-green above, becoming yellowish on vertex and front of pronotum; marked with black as follows: eyes, antennae, a large round spot on front reaching to antennal sockets, tylus, legs, sternum, membrane and abdomen, or at least a broad, median vitta on tergum and venter. Callosities sometimes black.

The type was from Ormsby County, Nevada, and I took a small series at Fallen Leaf Lake, California, in July, at an altitude of 6300 feet. Dr. J. C. Bradley has sent me two females that he took at Roger's Pass in the Selkirk Mountains, British Columbia, in July, 1908. These differ from the type form in having a darker vestiture and in having a black mark covering the callosities and most of the front of the pronotum and a black dot on either side of the base of the vertex.

2. *Labopidea simplex* (Uhler)

Similar to preceding in size and form, but the elytral membrane is more developed in all the females I have seen. Like *nigripes*, it has a bluish-green color above, with pale pubescence and black antennae, but here the legs and lower surface are mostly pale. Length 5 to 5.5 mm. to tip of membrane.

Basal depression of vertex large but sometimes obscure, with hind margin quite distinctly carinate. Callosities small, prominent.

Dextral genital hook of male enlarged into a nearly circular hirsute plate; sinistral broad as in *nigripes*, but obtusely produced exteriorly and acutely hooked at its inner angle.

Color dull bluish-green, becoming yellowish on pronotum anteriorly, on head, legs, and beneath. Frontal black spot obsolete, or indicated by a broad brown arc on either side; clypeus black, at least at base. Antennae black, middle of second joint more or less distinctly brown; callosities generally with black are bounding them behind. Basal suture of scutellum blackish. Elytra with costal border and cuneus paler, membrane quite uniformly smoky. Tarsi fuscous or black. Pale pubescence longer and denser than in *nigripes*.

The types were from Colorado. I took both sexes at Boulder in that state, July, 1903, and the Academy of Natural Sciences of Philadelphia possesses a series from Alamogordo, New Mexico, taken in April and May, 1902. As nearly as I can judge from Reuter's description, his *Hyoidea grisea* seems to be a straight synonym of this species.

3. *Labopidea sericata* Uhler

Size and form nearly of *nigripes*, male with very long elytra. Color whitish-green, with disk of pronotum and elytra strongly tinged with bluish-green; upper surface densely clothed with long white pubescence intermixed with deciduous silvery scale-like hairs. Length, female 4.5 mm.; male 7 mm., to tip of elytra.

Head proportionately longer and more pointed than in *simplex*. Base of vertex distinctly carinate in male, scarcely so in female, in which the transverse depression is much reduced. First antennal joint short, scarcely as long as dorsal aspect of the head; second about as long as hind margin of pronotum; third two-thirds length of second; fourth about half length of third. Pronotum short, in male strongly narrowed anteriorly; callosities large, oval, prominent. Elytra in male very long, apex of corium a little surpassing tip of abdomen; membrane long, whitish-hyaline, scarcely infuscated; nervures green; in female shorter

than abdomen, with membrane reduced to a mere border to apex of corium. Legs short, tibiae and some minute dots on apex of femora green.

* Dextral hook of male genitalia small, nearly circular at apex; sinistral subtriangular, its inner angle produced in a short tooth, the outer prolonged in an incurved subacute horn.

Color pale bluish-green, becoming yellowish on head, pronotum before, and on lower surface. Antennae pale, scarcely darker at apex. Sides of pectus and abdomen more or less greenish, perhaps wholly green in life. Tibiae pale, with minute pale hairs and a few longer brownish bristles. Elytral costa paler; membrane whitish, with a very faint apical clouding, nervures green.

The types of this species were from Colorado, and I found it common at Denver, Boulder, Ward, and Sunset, Colorado, in July, 1903. The female has been determined for me as *Labopidea chloriza* Uhler, but it wants the black markings mentioned in Uhler's description, and for the present I prefer to consider *chloriza* as a species unknown to me.

***Labopidea atriseta* n. sp.**

Closely allied to *sericata* Uhler, but distinguishable by having infuscated antennae, and tibiae armed with conspicuous black bristles set on black dots, while in *sericata* these bristles are weaker and fewer and are not inserted in black points. Color as in the preceding form. Length 5 mm. to tip of membrane.

Head as in *sericata*, vertex feebly carinate at base; front convex, clypeus prominent. Antennae a little longer than in allied species; second joint about three times as long as basal; third, three-fourths the length of second, the fourth short. Rostrum a little shorter than in *sericata*, scarcely attaining apex of intermediate coxae. Elytra with membrane developed in all my specimens, apex of cuneus attaining tip of abdomen.

Color a soiled whitish, more or less tinged with dull green below; disk of pronotum and scutellum and the elytra dull bluish-green, costal margin broadly pale; cuneus pale except its inner angle. Membrane obviously infuscated, with a deeper shade outwardly beyond the areoles. Antennae infuscated, basal joint pale. Hind femora distinctly dotted with greenish-brown exteriorly, tibiae armed with stout black bristles much longer than the width of the joint, each springing from a black point. Tarsi and tip of rostrum black.

Described from four females taken by me at Alpine, Mussey's, and Sweetwater Valley, San Diego County, California, in April and June.

Genus **Macrotyloides**, n. gen.

Elongate, ovate, widest near apex of clavus. Head strongly produced, subhorizontal, with eyes as wide as pronotum at transverse incisure and a little more than half its basal width, its length about equal to the median length of pronotum. Vertex sometimes flattened or impressed before the base, leaving the edge obtusely prominent, but scarcely carinate as in *Orthotylus*. Vertex and front together when viewed from above scarcely longer than wide, but slightly convex. Clypeus prominent, arcuated before, its base well distinguished from the front and on a line with the antennal sockets. Inner cheeks prominent, the outer narrow. Eyes rather small, their inner margins feebly divergent; viewed from the side oval, a little oblique, reaching over half-way to gula; gula nearly horizontal. Antennae long, inserted close to lower angle of eyes, first joint with two setae within near their apex. Rostrum long, attaining middle of venter. Pronotum trapezoidal, its anterior margin about half the posterior; sides rectilinear, obviously carinated; callosities large, little elevated. Basal lobe of scutellum exposed. Prosternal xyphus with margins carinate. Elytra rather short, with costa quite strongly arcuated. Wing-cell without a hamus. Legs rather long; tibiae with short, feeble bristles. Hind tarsi linear, joints but slightly distinguished, basal shorter than the other two, which are subequal; claws short, arolia rather large, free and connivent, not equalling the claws. Vestiture not very dense, of soft white hairs sometimes intermixed with stiffer fuscous ones.

Type of the genus *Macrotylus vestitus* Uhler.

This genus includes rather large green Capsids suggesting *Labopidea* Uhler, but with smaller eyes and a produced oblique head as in *Macrotylus*; the tylus less prominent and the claws large, with their arolia free and approaching at apex. When the elytra are closed the body is conspicuously narrowed both before and behind. Our species may be distinguished as follows:

Membrane about equally and lightly infuscated.....	vestitus Uhl.
Membrane with the apex abruptly fuscous	apicalis n. sp.

Macrotyloides vestitus (Uhler)

Long ovate, narrower before; pale grass-green, becoming yellowish when dry; membrane very faintly and uniformly en-fumed. Length 5 to 6 mm.

Head nearly horizontal. Vertex hardly flattened, more than twice as wide as the eyes in the male, its basal margin appearing a little thickened in some individuals; front, feebly convex

obscurely transversely striate. Basal joint of antennae surpassing tip of clypeus by nearly half its length; second slender, about four times the length of first; third and fourth together nearly as long as second, fourth about equal to first. Rostrum reaching on the third ventral segment in the female, to the fifth in the male, first joint surpassing base of head. Pronotum nearly flat and horizontal, the surface before callosities scarcely depressed, anterior edge with a slight median sinus; sides straight, subcarinate. Scutellum equilateral. Elytra elliptical, nearly flat, cuneus scarcely longer than broad; abdomen reaching to middle of cuneus in the male, nearly to apex of membrane in the female. Membrane surpassing cuneus by about one-third its length.

Male genital pieces large; dextral hook very large and curved in conformity with the margin of anal opening, in form ligulate, its subacute tip reaching over onto apex of tergum; sinistral almost equally long and similar in form, produced either way and lying parallel with and just below the dextral, its inner end obtuse, the outer acute. Female pygofers short, beginning behind middle of venter, hind edge of fourth segment almost straight across.

Color pale green, becoming yellowish on head, pronotum, legs, antennae, and lower surface in dried specimens. Antennae infuscated toward apex. Tibial bristles fuscous; apex of tarsi black. Vestiture composed of a fine soft pubescence and short stiff fuscous hairs intermixed. Membrane nearly hyaline, nervures green.

Redescribed from five male and three female examples taken in San Diego County, California, at Alpine, Mussey's, and Foster's, from April to June.

***Macrotylodes apicalis* n. sp.**

Closely allied to the preceding; a little shorter behind, with apex of membrane deep smoky brown. Length 5.5 to 6 mm. to tip of the membrane.

This species is very close to the preceding in most of its characters, but the elytra are shorter, making the insect appear broader; tibial bristles shorter and more slender, and the basal joint of the rostrum scarcely passes the base of the head. Oviduct of the female longer, beginning distinctly before middle of venter, with fourth ventral segment strongly oblique, not practically transverse as in *vestitus*. Color light green, becoming yellowish on head, pronotum, and below, as in *vestitus*. Antennae infuscated at apex. Membrane whitish-hyaline with its apex beyond the tip of cuneus abruptly blackish-fuscous.

Described from six females from southern California. I took it at Alpine, San Diego County, in June, and Mr. Fordyce Grinnell has sent me specimens taken at Pasadena, June, Los Angeles, September, and from the Santa Rosa Mountains.

Pseudopsallus n. gen.

Aspect of *Plagiognathus* nearly, but having cell of wing without a hamus and arolia free and connivent. Body clothed with long black hairs and short, appressed, silvery scale-like hairs or tomentum, which soon wear off, leaving the insect smooth.

Head broad and short, vertical. Vertex with an oblique impression either side, leaving the base prominent but hardly carinate. Front moderately convex, perpendicular or nearly so. Clypeus broad, somewhat prominent, but little compressed; base well distinguished from the front; apex of head blunt, produced below the eye for less than length of the eye. Eyes large, prominent, viewed from the side ovate, reaching below middle of side of head. Antennae inserted near lower angle of eye, short, stout; basal joint not longer than head viewed from above, second scarcely thinner at base than first. Pronotum transverse, smooth, anterior margin about half the length of the posterior, sides ecarinate, nearly straight, anterior angles broadly rounded. Callosities large, little elevated. Basal lobe of scutellum covered. Elytra broad, costal margin considerably arcuated in the female, nearly parallel in the male. Rostrum reaching onto base of venter; oviduct of the female long, beginning before middle of venter. Wing-cell without a hamus. Legs thick, irregularly dotted, tibial spines stout, black. Tarsal claws small but longer than in *Macrotylus*; arolia free and connivent.

Type of the genus *Macrotylus angularis* Uhler.

The type species has much the aspect of a large *Plagiognathus*, but the absence of a hamus in the wing-cell and the free connivent arolia places it in the *Orthotylini*, where there is no established genus that will receive it.

Pseudopsallus angularis (Uhler)

This species and the next are broad forms, and have little in common with the other genera of the *Orthotylini*, but they must be placed in that tribe. *Angularis* is a slaty-brown species with the claval suture, costa, the two principal nervures of the corium, and the membranar nervures whitish, sometimes tinged with yellow on the costa. The region of the callosities is black varied with white, and the head is white, with the oblique impressions

of the vertex, a large arc on either side of the front, some marks on the base and sides of the clypeus and the lorae black. The antennae are black, the second joint as long as the base of the pronotum and one-fourth longer than the third and fourth taken together. The legs are white, with the tibiae dotted with black. The white markings, especially on the head and pronotum may become more or less orange.

Dextral hook of the male genitalia apparently a flattened truncated scale scarcely longer than broad; sinistral very large, expanded on the right to base of dextral hook and exteriorly narrowed and curved upward and inward to superior aspect of anal opening.

I took three examples of this insect from the white sage growing on the mesa at East San Diego, California, during April and May, 1913.

***Pseudopsallus verticalis* (Uhler)**

This is a smaller, pale brown or testaceous form. with the head and anterior lobe of the pronotum fuscous, the base of the vertex marked with pale, and the legs pale dotted with fuscous. The types were from California. I possess one female taken by Mr. Fordyce Grinnell at Pasadena, May 25, 1909, and another taken in Colorado was sent to me by Professor Baker labelled *Macrotylus verticalis* Uhl. MS. It probably was by an oversight that Dr. Uhler failed to mention the Colorado locality in connection with his description.

***Argyrocoris femoratus* n. sp.**

Smaller and darker-colored than *scurrilis*; slender; testaceous-grey, more or less infuscated, cuneus dotted with red. Length 4 mm. to tip of membrane.

Head strongly oblique; vertex convex, ecarinate; front moderately convex. Eyes large oval, viewed from the side oblique and attaining gula, coarsely granulated. Antennae long; basal joint surpassing head by one-half its length; second over three times the length of first; third and fourth together about equal to second. Pronotum transverse, its length about three-fifths its basal width, anterior margin about two-thirds of posterior; hind edge depressed, covering basal lobe of scutellum. Rostrum long, reaching middle of venter. Elytra long and narrow; tip of abdomen not attaining apex of corium, cuneus slender, its length nearly three times its basal width in the male. In the female the abdomen reaches to about the middle of the cuneus, which is

broader and shorter than in the male. Hind femora long and much flattened.

Male genitalia small; dextral hook about twice longer than its basal width and tapering to a point; sinistral oval and lying along the sinistral notch.

Color greyish-testaceous; callosities narrowly black; disk of pronotum with two broad fuscous rays more or less distinct. Scutellum infuscated or almost black. Elytra dotted with sanguinous on cuneus and sometimes more sparsely on corium and clavus. Membrane deeply infuscated, nervures pale dotted with red. Wings somewhat infuscated, with blackish nervures. Body beneath infuscated. Antennae and legs pale, femora dusky, hind pair more or less dotted with red points; tarsi black at apex. Antennae slightly infuscated toward their apex. Upper surface clothed with minute silvery pubescence, obscurely arranged in lines which are more distinct on the head, where they form three longitudinal vittae.

Described from numerous examples beaten from chaparral in San Diego County, California, at Coronado, National City, Alpine, etc., in May and June.

At first sight this species seems very different from *scurrilis*, but a closer inspection shows that it possesses similar generic characters and there can be no doubt that it should be placed in the same genus.

***Parthenicus picicollis* n. sp.**

Allied to *psalliodes*, but with pronotum, scutellum and commissure piceous or almost black; beneath more or less infuscated, above pale, more or less closely dotted with sanguinous points, elytra appearing dark red; membrane black. Length 3 mm. to tip of membrane.

Head vertical; vertex and front conjointly flattened above, a very little convex below, base of vertex eearinate. Clypeus prominent, but somewhat less so than in *Macrotylus*, its base well distinguished and distinctly above line of antennae. Eyes large, prominent, projecting for nearly their whole width beyond the pronotal angles; viewed from the side broad-oval, vertical, reaching almost to gula, face but little prominent before the eyes, almost half of this being projection of clypeus. Antennae rather short, first joint but little surpassing clypeus; second longer than basal margin of pronotum. Pronotum moderately convex, callosities small and little elevated, distinguished behind by a deeply incised line. Basal lobe of scutellum covered. Costal margin of elytra feebly arcuated. Cuneus about as long as wide at base in

the female, longer in the male. Hind femora about one-third as wide as long in the female, hardly one-fourth in the male.

Dextral hook of the male genitalia slender toward its apex, bent at a right angle dorsally; sinistral somewhat crescentic, its inner (dextral) angle produced.

Ground color pale yellowish-testaceous. Head, legs, and elytra dotted with dark sanguinous, the latter closely, almost confluent so, appearing as if washed with red. Antennae pale, basal joint red, apex slightly infuscated. Pronotum and scutellum deep piceous or almost black; elytral commissure evenly and indefinitely clouded with fuscous, this clouding scarcely extending onto inner angle of corium. Membrane blackish, with a pale line around apex of cuneus, nervures red. Face sometimes dusky, clypeus and cheeks clear red. Lower surface and base of hind femora more or less infuscated; tibial bristles fuscous, springing from sanguinous dots. Upper surface clothed with a fine pale pubescence.

Described from fifteen examples beaten from *Adenostoma* in San Diego County, California, from July to October. Although closely allied to *psalliodes*, this form seems sufficiently distinct by its dark pronotum, scutellum and lower surface, and the concolorous inner angle of the corium.

Transmitted January 3, 1916.

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ENTOMOLOGY

Vol. 1, No. 5, pp. 229-249

May 23, 1916

NOTES ON SOME HEMIPTERA TAKEN
NEAR LAKE TAHOE, CALIFORNIA

BY

EDWARD P. VAN DUZEE

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LAKE TAHOE, CALIFORNIA

BY
EDWARD P. VAN DUZEE

In the summer of 1915 it was my privilege to spend about five weeks in the Sierra Nevada with the entomological field class of the University of California Summer School at Fallen Leaf Lake, Eldorado County, California. We reached Fallen Leaf Lodge, our headquarters, on June 21 and left on July 31, a period which covered the season of greatest abundance of insects in certain of the orders, notably the Hymenoptera, Diptera and Lepidoptera, and the Coleoptera were perhaps at their best before we left; the Hemiptera and Orthoptera were, however, just coming into season, so the material obtained in these orders was but fragmentary. Circumstances were such that I was able to devote much of my time to the collection of insects for the University Museum, and Professor Woodworth added a number of interesting forms during two brief visits to the Lodge, while other members of the party turned over to me some good things taken by them. Altogether over six thousand mounted insects were brought home, a study of which will undoubtedly make valuable additions to our knowledge of the Sierran insect fauna.

The present paper deals with the Hemiptera taken, but, owing to the earliness of the season, must be but an imperfect representation of the hemipterous fauna of that portion of the Sierra. Of the one hundred and forty species enumerated, perhaps one-third are known to inhabit the coast region of California and about one-fourth are common to the eastern and

northern portions of the United States and Canada. A number of forms characteristic of the Rocky Mountain region were taken, as well as several found in the hilly back-country of San Diego County, California. However, before any really useful studies on the distribution of the Hemiptera of this portion of the Sierra Nevada can be made, it will be necessary to do systematic collecting there during August and early September. It is interesting to note that twenty-one of the species taken, or approximately one-seventh, are new to science, which shows how little is now known of the Hemiptera of the Lake Tahoe region.

The following notes on localities will indicate the conditions under which most of the material was taken.

Lower end of Fallen Leaf Lake.—On the west side of the lake from Cathedral Park and the sawmill to the outlet and some distance north was an interesting locality with low, rich woods and open, marshy fields. Mosquitoes were a serious hindrance here but the Hemiptera were more numerous than elsewhere, perhaps because the season was earlier at this altitude, 6300 feet.

Lateral Moraine.—A sharp ridge along the eastern side of the upper end of Fallen Leaf Lake, with an elevation of about 800 feet above the lake. This ridge was well covered with chaparral and until about the tenth of July made an excellent collecting ground for the Hymenoptera, Diptera and Lepidoptera. After that date it became too dry for good collecting.

Angora Lakes.—Situated under the eastern escarpment of the Angora Ridge at an altitude of about 7500 feet. Collecting here was poor.

Glen Alpine Springs and Creek are situated in a valley running west from the upper end of Fallen Leaf Lake. Below Glen Alpine Springs the valley is well wooded and afforded excellent collecting places. Toward the last of July the northern side of the valley formed by the southern slope of Mount Tallac proved to be one of our best collecting grounds.

Cathedral Lake, in a valley on the eastern slope of Mount Tallac at an altitude of about 7500 feet, was a moderately productive place, especially lower down near Floating Island Lake.

Mount Tallac.—The sloping alpine meadow on the western aspect of the mountain was a wonderfully interesting place from about the twentieth of July. The altitude here varied from about 8000 to over 9000 feet.

Angora Ridge.—The western slope of this ridge was an alpine meadow of equal altitude and hardly less interesting than that on Mount Tallac.

Half Moon Lake under Dick's Peak at an altitude of about 8000 feet proved to be an interesting place in late July. Several eastern forms not found elsewhere were taken here.

Grass Lake in the valley above Glen Alpine Springs at an altitude of about 7500 feet did not yield much of interest, but might have been better if visited later in the season.

HETEROPTERA

Thyreocoris anthracinus Uhler. July. Taken in numbers from a low plant growing in grassy places along the roadside from Tallac to the sawmill at the lower end of Fallen Leaf Lake.

Homoemus bijugis Uhler. Taken with the preceding.

Eurygaster alternatus Say. Abundant with the foregoing species.

Trichopepla atricornis Stål. Found occasionally on rank weeds about the lower end of Fallen Leaf Lake, July 17.

Thyanta custator Fabr. Not uncommon on trees and bushes everywhere below 8000 feet.

Banasa sordida Uhler. A single specimen swept from weeds at Half Moon Lake in July.

Tollius curtulus Stål. Low ground near Tallac, July.

Alydus pluto Uhler. One example taken on weeds growing on a dry sandy spot near Tallac in July.

Harmostes reflexulus Say. Not uncommon with the preceding.

Corizus scutatus Stål. Common on the low lands between Tallac and Fallen Leaf Lake in July.

Corizus indentatus Hambl. Taken with the preceding.

Corizus hyalinus Fabr. Generally distributed, but not common, up to 8500 feet.

Corizus crassicornis Linn. Half Moon Lake, July 23.

Aradus debilis Uhler. This, our largest western aradid, is paler than most of our species, has the abdomen of the female much produced and attenuated at apex and the third antennal joint white with its extreme base and the large apical joint black. Mr. Ralph Hopping took a series on fungi under the bark of a dead pine tree near the margin of Fallen Leaf Lake, July 2, Dr.

Van Dyke found one in a similar situation, and I took a male near Glen Alpine Springs, June 30.

Aradus hubbardi Heid. A fine series of this species was taken from fungus growing on a fallen pine tree along the trail to Angora Lakes at an altitude of about 7000 feet, July 11. In all the specimens taken the tip of the second antennal joint is scarcely paler.

Aradus persimilis, new species

Very close to *hubbardi*, differing principally in having the scutellum much broader at apex, the expanded portion of the costa longer and the antennae a little thinner, with their second segment perhaps a little longer and the third without a pale apex. Length, male 6.5 mm., female 7.5 mm.

Head as in *hubbardi*; anterior process thick, cylindrical, compressed toward the apex, reaching nearly to basal third of second antennal joint. Spine at base of antennae almost attaining the tip of first joint and armed exteriorly with a very short tooth. Occiput with a tubercle before the eye and another near its hind angle. Antennae about as in *hubbardi*, perhaps a shade thinner; first segment about one-half longer than wide, second about as long as the head, a little thickened at apex; third hardly one-half the length of second; fourth still shorter, narrowed to its base with a short conical tip. Pronotum about as in *hubbardi*, slightly longer and more broadly expanded about the humeri; sides irregularly dentate; four discal carinae nearly parallel, exterior percurrent, not becoming obsolete before as in the allied species. Abdomen as in *hubbardi*; genital segment of the female a little shorter and less expanded; genital lobes of the male shorter and more transverse. Rostrum nearly attaining hind margin of mesosternum.

Color fuscous-brown, becoming more ferruginous on the cephalic process, basal joints of antennae, pronotal carinae, principal elytral nervures, extreme tip of scutellum, and in places on abdomen. Antennae becoming black on apical two segments, conical tip of fourth sericeous pubescent. Expanded basal portion of costa and broad humeral areas and marginal serrations whitish-testaceous; elytral reticulations sometimes of the same pale color. Legs and beneath usually paler. Abdomen becoming more castaneous toward its margin, where it is often minutely pointed with green, the hind edge of the connexival segments pale; membranal veins distinctly pale.

Described from three male and two female specimens taken near Glen Alpine Creek, June 25 to July 3. While very near *hubbardi* this form seems to have good specific characters and is at least a valid subspecies. I possess one female, taken by Dr. J. C. Bradley in the Santa Cruz Mountains, California, in May, 1907, that differs from the types only in having the humeral expansion of the pronotum concolorous.

Aradus borealis Heid. Professor Woodworth took one example of this species on the eastern slope of Mount Tallac along the trail from Cathedral Lake to Floating Island Lake, on July 6, at an altitude of 7000 feet.

Aradus behrensi Bergr. A few examples were taken from trees near the upper end of Fallen Leaf Lake, June 25. The next day I took near the lower end of the lake two specimens of what I believed to be brachypterous or imperfectly developed specimens of the same species. In these the elytra reach only to the base of the fifth abdominal segment.

Aradus insolitus, new species

A small, black species marked with pale granules; humeral angles subacute, latero-anterior margins a little concavely arcuated, second antennal joint narrowly white at apex. Length 4 mm.

Form narrow ovate, about as in *tuberculifer* Kirby. Head with a short oblique impressed area on either side interior to the eye. Antenniferous tubercles with a large acute spine which surpasses the middle of first antennal segment. Antennae regularly but moderately thickened to apex of third joint; basal scarcely longer than broad, second about as long as the distance between the eyes, uniformly thickened toward its apex, white apical portion about as long as the thickness of the joint at base; third and fourth about equal in length, the latter fusiform. Pronotum rather small; humeri prominent, subacute, the margins behind them feebly rounded, the latero-anterior margin a little concavely arcuated with the anterior angles prominent and subacute; entire lateral margins quite regularly and minutely crenulate; disk a little depressed across the middle, marked posteriorly with four parallel carinae which become confused anteriorly. Scutellum narrow, about as long as pronotum, obtuse at apex, margins but little elevated. Elytra reaching nearly to tip of abdomen, but little narrowed apically; costa regularly but moderately dilated at base. Nervures of corium and membrane prominent. Rostrum reaching but little beyond the base of the head, encroaching upon base of the prosternum about the width of the sternal sulcus at its middle; this sulcus expanded at base and apex. Genital lobes of the male about as in *similis*, the oblique apical margins a little more rounded.

Color almost black; narrow apex of second antennal segment, tips of the humeri, broad but indefinite apex of scutellum, knees, tips of the tibiae and apical angles of the abdominal segments pale or whitish. Whole surface irregularly dotted with minute greenish-white granules, most numerous on the head, disk of scutellum and elevated areas of pronotum and elytra; granulations of connexivum becoming a clear sea-green in places.

Described from two males taken about the upper end of Fallen Leaf Lake, July 12. This species is very distinct from any other known to me by its subacute humeral angles and the concave latero-anterior margins of the pronotum. The short rostrum allies it with *Quilnus* and in some respects it is intermediate between that subgenus and the more typical aradids.

Aradus falleni Stål. One specimen taken from a fallen pine tree near Cathedral Lake on the eastern slopes of Mount Tallac, July 5.

Mezira moesta Stål. A single individual of this common form was taken near the upper end of Fallen Leaf Lake on July 2.

Lygaeus reclinatus Say. Found in numbers on a patch of milkweed near the sawmill at the lower end of Fallen Leaf Lake, July 25.

Lygaeus truculentus Stål. A few taken on flowers near the lower end of Fallen Leaf Lake in July.

Lygaeus bicrucis Say. Taken at Grass Lake and near Fallen Leaf Lake in late June and early July.

Nysius californicus Stål. Common at lower levels but also found at Half Moon Lake and up to 8500 feet on Mount Tallac.

Nysius ericae Schill. Half Moon Lake, July 23.

Nysius ericae minutus Uhler. A few taken near Tallac in July.

Ischnorrhynchus resedae Panz. One specimen was beaten from chaparral along the trail on the west shore of Fallen Leaf Lake, July 5.

Geocoris pallens decoratus Uhler. One example taken on the low lands near Tallac on July 25.

Ligyrocoris diffusus Uhler. With the preceding.

Sphragisticus nebulosus Fall. Swept from grass near the lower end of Fallen Leaf Lake, July 17.

Rhyparochromus angustatus Van D. This form may be roughly distinguished from *sodalicus* Uhl. by its having the third antennal joint entirely black, the lateral edges of the pronotum concolorous and the clavus ferruginous at base. It is a long narrow form and northern in its distribution. Here it was found near Tallac in July.

Scolopostethus thomsoni Reut. Three examples were taken at Tallac and about the upper end of Fallen Leaf Lake in July.

Ploiariodes sp. One example taken at the Lodge in July.

Nabis ferus Linn. Found everywhere. Here the species has every appearance of being a native insect and possibly it is indigenous to all the northern portions of this continent.

Anthocoris bakeri Popp. Taken near the Lodge, June 21. Poppius' paper describing this species never reached me and I was unaware of its existence until after the publication of my species *ornatus*, which is undoubtedly identical with *bakeri*.

Anthocoris antevolens White. Taken on the low lands about Fallen Leaf Lake in July.

Anthocoris melanocerus Reut. Two examples were beaten from the chaparral along the western shore of Fallen Leaf Lake, July 5.

Saldula interstitialis Say. One taken at Tallac July 25.

Saldula sp. Taken on the low lands about the lake and up to 8500 feet on the western slope of Mount Tallac.

Gerris orba Stål. Found on Fallen Leaf Lake, Cathedral Lake, Angora Lakes and elsewhere, in July.

Gerris gillettei L. & S. One example taken at the sawmill at the lower end of Fallen Leaf Lake, July 25.

Stenodema vicina Prov. Taken on grassy openings along Glen Alpine Creek, at Half Moon Lake, and on the western slopes of Angora Peaks, in July. No males were found but the females were not uncommon.

Platytyellus intercidenda Dist. Occasional on rank vegetation about the lower levels after July 16.

Phytocoris eximius Reut. Glen Alpine Springs, July 30. This species and the next were only just reaching maturity when I left, the last of July.

Phytocoris inops Uhler. With the preceding. This is a smaller species having the membrane varied with whitish and fuscous in coarser blotches, the antennae longer and more slender, with the basal joint more obviously banded and the pale incisures broader.

Ectopiocerus anthracinus Uhler. Occasional in July at the lower levels.

Poeciloscytus uhleri Van D. Taken at the level of Fallen Leaf Lake and up to 8500 on the west slope of Angora Peak, toward the last of July.

Poeciloscytus venaticus Uhler. Not uncommon on rank weeds about the lower end of Fallen Leaf Lake in July.

Dichrooscytus speciosus, new species

Allied to *suspectus* but more polished. Black; disk of head, pronotum and elytra deep rich wine-red; scutellum, base of cuneus and legs white; antennae soiled white. Length nearly 6 mm.

Head broader and shorter than in *suspectus*, vertex strongly impressed before the basal margin and more broadly on either side; middle of vertex quite strongly swollen and polished, without the transverse striae seen in the allied species; basal carinae prominent across the whole width. Pronotum narrower anteriorly, meeting the vertex near the inner angle of the eye; surface more strongly punctured, callosities smaller and highly polished; median line obscure but evident. Scutellum prominent, narrower than in *suspectus*, polished, a little transversely shagreened toward the base. Elytra polished, very obscurely punctured and shagreened, almost parallel, costa straight basally.

Color black, highly polished; base of vertex obscurely reddish. Pronotum deep wine-red with anterior and posterior margins black. Scutellum ivory-white, becoming black on anterior lobe beneath base of pronotum. Elytra dark wine-red; broad margins of clavus about scutellum and the apex of corium black; cuneus black, the basal half ivory-white omitting the slender costal margin. Membrane deep fuscous, iridescent, the nervures concolorous. Legs including coxae white, coxae and trochanters sometimes tinged with greenish; apex of the tibiae and the tarsi slightly infuscated, last tarsal joint becoming black at apex. Antennae soiled white, a little more infuscated toward the apex. Tergum and apex of abdomen more or less sanguinous.

Described from numerous examples beaten from juniper trees during July, mostly on the south slope of Mount Tallac. The first mature examples were taken near the Lodge on July 5 but the adults did not become abundant until after the middle of the month. This is one of the most beautifully colored capsids known to me. The immature have paler colors but the pattern is distinct and characteristic.

Dichrooscytus suspectus Reut. Common on juniper trees during July. These individuals are more uniformly colored with rufous than those from Colorado determined for me by Dr. Reuter, but they can hardly be distinct.

Dichrooscytus irroratus Van D. Common on juniper and cedar trees everywhere between 6000 and 8000 feet. In most of these examples the elytra are of an almost uniform pinkish color with a deeper tint on the cuneus, and marked with a fuscous vitta on the apex of the corium; an oblique vitta on their middle and the apex of the membranal areoles are also fuscous.

Dichrooscytus elegans Uhler. Taken with the preceding forms but less abundantly and a little earlier.

Lygidea rebucula obscura Reut. Three examples were taken about the Lodge July 20 and 21. These differ in no respect from specimens taken in the state of New York.

Platylygus luridus Reut. Not uncommon on Jeffrey pines from July 8. These are larger than eastern specimens but do not otherwise differ.

Lygus pratensis Linn. The pale form with yellowish scutellum which is characteristic of the Californian fauna was common at all the lower levels and up to 8000 feet. Three examples of the dark eastern form were taken on July 23 at Half Moon Lake.

Lygus plagiatus Uhler. This form was common above 7500 feet but rarely was taken at lower levels.

Lygus campestris Linn. Common about Fallen Leaf Lake and up to 7800 feet at Half Moon Lake.

Xenoborus canadensis Van D.? One example which may represent a distinct species differs in being smaller and in having the basal joint of the antennae and the tylus concolorous.

Camptobrochis validus Reut. Four examples were taken about Fallen Leaf Lake and Grass Lake from June 23 to July 5.

Camptobrochis fulvescens Reut. Beaten from pine on the south slope of Mount Tallac on July 30. These specimens are glabrous and have much the aspect of *nitens* but the male genital characters are those of *fulvescens* and I prefer to so place them for the present.

***Deraeocoris ingens*, new species**

Large, deep black, polished; second antennal joint greatly thickened. Length 8 mm.

Aspect of *Capsus ater*, but much larger and more elongated, with antennae more clavate. Head as in *Camptobrochis*, prominent; hind margin of vertex and eyes nearly rectilinear. Vertex almost flat, basal margin subcarinate behind a shallow depression. Antennae stout, inserted before the eyes at a distance about equal to the thickness of first segment; this segment as long as the median width of vertex; second (3.5 mm.) longer than basal width of pronotum, at base more slender than first but regularly thickened to near its apex, where it is as thick as the antero-posterior diameter of the eye, its surface closely pubescent and armed with a few longer hairs; third and fourth segments short and slender but not setaceous, together equal to length of the anterior tarsi, third scarcely longer than fourth. Pronotum shaped much as in *Camptobrochis*

nigrita, much narrowed anteriorly, where it is a little wider than the base of the vertex; surface convex in both diameters, strongly punctured; callosities large, highly polished, impunctate, scarcely elevated and poorly defined; sides nearly straight or slightly concave. Scutellum more finely punctured. Elytra coarsely punctured, long, narrowed from the middle. Membrane long and narrow, nervure dividing the areoles obsolete or nearly so. Prosternal xyphus depressed with a carinate margin. Basal joint of hind tarsi stouter, as long as second and third together. Arolia as in *Camptobrochis*, wanting or very minute and connate with the claws, between which are two slender parallel setae. Male uncus formed about as in *Camptobrochis nitens* with a sharp curved hook at distal end which almost attains the line of the proximal extremity.

Color a uniform deep coal-black, brilliant; membrane a dead blackish-fuscous, scarcely lighter next the point of the cuneus; base of vertex and knees touched with fulvous. Second antennal joint nearly to its apex and the tarsi piceous, verging toward castaneous. Osteolar margin white.

Described from nine examples representing both sexes, all beaten from Jeffrey pines along the south slope of Mount Tallac above Glen Alpine Creek during late July. This is one of our largest capsids, and it seems strange that it should have remained unknown for so long unless it be restricted to the Jeffrey pine, which has a range in the Sierras and northwardly where little work on Hemiptera has been done. Dr. Poppius has recently sunk *Camptobrochis* as a synonym of *Deraeocoris*, but I think it better to restrict the latter genus to those species having a clavate second antennal joint.

***Deraeocoris fraternus*, new species**

This form seems to differ from *ingens* principally in being smaller (6 mm.) and in having the basal one-half of the second antennal joint and the legs pale or even bright rufus, with the apex of the tibiae darker and the tarsi black. Generally there is a pale annulus beyond the middle of the tibiae and the margins of the pleural pieces are whitish, usually broadly so.

Described from ten examples representing both sexes taken with the preceding. I would consider this but a color variety of *ingens* were it not for its much smaller size and the constancy of its characters.

***Largidea grossa*, new species**

Form nearly that of *marginata*, but larger; dull rufus-brown, whole upper surface closely and coarsely punctured. Length to tip of membrane 6 mm.

Head impunctate, polished, clothed with sparse, short appressed pale pubescence; viewed from above short, transverse, gently swollen before; width about twice its greatest length; when viewed from before five-angled, portion above the antennae almost quadrangular with sides straight and parallel, apex obtuse; base of clypeus but feebly distinguished from the front. Rostrum attaining the base of the intermediate coxae. Antennae as in *marginata*, inserted near lower angle of eye; basal joint scarcely longer than the eye; second joint is as long as vertex and pronotum taken together, flattened horizontally and broadly lanceolate, its width equal to length of first joint, its lower surface feebly convex, the upper deeply sulcate nearly to the apex; third and fourth thin, fusiform, each subequal to the first in length. Pronotum broader and less narrowed anteriorly than in *marginata*, sides straight, distinctly carinate, attaining the middle of the eyes; posterior lobe deeply closely punctured; anterior lobe nearly smooth, gray-pubescent, transverse impressed line deep, black, bent back in a barb at either side of the median line. Scutellum strongly convex, closely but not deeply punctured. Elytra closely punctured, the costa bent beyond the middle. Cuneus long, but moderately depressed. Membrane long, surpassing the abdomen by one-half its length. Basal joint of the tibiae broad and flattened, scooped out below, wider than the apex of the tibiae and as long as slender third joint; second short, slender like third, deeply inserted in upper surface of broad first joint. Oviduct beginning before middle of venter.

Color dull rufus-brown inclining to wine-red but not as deep a red as in the allied *marginata*. Whole surface closely but not conspicuously pale-pubescent; disk of head and much of lower surface blackish; costa paler; membrane black, nervures black at base, paler beyond. Antennae reddish. Tarsi and venter blackish.

Described from a single female example taken on Jeffrey pine on the south slope of Mount Tallac near Glen Alpine Springs, July 30, at an altitude of about 7000 feet. It is possible that the expanded basal joint of the tarsi and the fact that the second antennal joint is scooped out above instead of below would entitle this form to generic distinction, but it does not seem advisable to separate it until the male has been examined. In the type specimen the thickened apex of the second antennal joint is somewhat bent, making the antennae appear to be five-jointed when viewed from the side.

Dacerla inflata Uhler. This singular looking ant-mimic was quite abundant after the middle of July at most all locations but especially along the southern slope of Mount Tallac. A few were seen above 8000 feet on Angora Ridge. It was most abundant on the lodge-pole pine, but it occurred on other trees and

a few were swept from weeds near the lake. The males scarcely differ from the females and in both sexes some individuals are paler or reddish. The pronotum and parts of the elytra that are gray in the black form are ferruginous in the pale, but most of the material taken answers in every respect to the excellent description given by Dr. Uhler.

Coquillettia insignis Uhler. Three males of this pretty species were swept from weeds near the sawmill on Fallen Leaf Lake, July 25, and one was taken next day from the western slope of Angora Peak above 8000 feet.

Dicyphus californicus Stål. A few were taken about Fallen Leaf Lake late in July.

Dicyphus agilis Uhler. With the preceding but more abundant. I distinguish this from *californicus* by its larger size, paler colors, the almost entire want of red on the elytra, the more tumid and exposed base of the scutellum and especially by the shorter basal joint of the antennae.

Dicyphus vestitus Uhler. One example was taken July 17 near the lower end of Fallen Leaf Lake.

Dicyphus crudus, new species

Form and size of *agilis*; pale greenish-white. Length 5 mm., width across the elytra little more than 1 mm.

Vertex less swollen than in *agilis*, eyes a little more prominent, with antennae longer and pronotal collar more elongated. Elytra very long, parallel, membrane surpassing abdomen by two-thirds its length.

Color pale greenish-white, deeper green on anterior lobe of pronotum, pleural pieces and base of scutellum. Eyes and tips of the tarsi black. Neck with a fuscous cloud behind each eye. Elytra almost pellucid, sparsely clothed with short appressed white hairs. Membrane with a faint longitudinal dusky cloud behind the areoles. Arolia long, lying near the small claws. Apical joint of the antennae, oviduct and genital segment of the male slightly embrowned.

Described from one pair taken on the flats near the lower end of Fallen Leaf Lake. This insect might be taken for the immature form of *agilis* were it not for the longer elytra, broader collar and flattened vertex. The fuscous cloud behind the eyes is also distinctive.

Labops hesperius Uhler. One example was taken July 31 on the shore of Lake Tahoe near the Hotel Tallac.

Lopidea nigridea Uhler. Several specimens of what I take to be a smaller form of this species were taken about Fallen Leaf Lake during July. This small form is but 4 mm. to the tip of the abdomen, the surface is more slaty-black with the stiff hairy vestiture more pronounced, and the markings are paler, being but rarely tinted with red. The male genital characters are nearly identical and it does not seem best to try to distinguish them at present.

Hadronema militaris Uhler. One example was taken on the shore of Half Moon Lake, July 23.

Hadronema robusta Uhler. A single specimen was taken with the preceding.

Paraproba hamata Van D. Upper end of Fallen Leaf Lake, June 21. A single specimen.

Orthotylus tibialis Van D. A good series of this very distinct species was taken in July from a low hirsute weed growing along the road between the sawmill on Fallen Leaf Lake and the Hotel Tallac. The descriptions of this and other new species in this genus will appear about simultaneously in the *Proceedings* of the California Academy of Science.

Orthotylus insignis Van D. A very pretty species, of which three examples were taken July 24 on the "short trail" to Glen Alpine Springs, where a tiny streamlet caused a rank growth of vegetation.

Orthotylus viridicatus Uhl. Not uncommon on the rank weeds growing near the lower end of Fallen Leaf Lake, at Half Moon Lake and near Glen Alpine Springs. The black membrane with conspicuous white veins will distinguish this pretty species.

Orthotylus uniformis Van D. A plain green species of which numbers were taken near Fallen Leaf Lake in July, mostly on the chaparral.

Orthotylus ovatus Van D. Common on junipers on the south slope of Mount Tallac late in July.

Orthotylus formosus Van D. Two examples of this very distinct form were beaten from alder bushes in a damp spot on the south slope of Mount Tallac about 200 feet above Glen Alpine Creek on July 30. I was unable to find any on the lower levels along the creek, but it is possible that the warmer location on the sunny hillside brought them out earlier than in the shaded valley.

Orthotylus affinis Van D. Abundant everywhere on willows

at the lower levels, but I also took them near Half Moon Lake at an altitude of about 8000 feet.

Orthotylus cuneatus Van D. Several specimens of this form were taken on willows about Fallen Leaf Lake in company of the preceding.

Labopidea nigripes Reut. A small series of this very distinct species were taken near the lower end of Fallen Leaf Lake in July.

Macrotylus multipunctatus Van D. The unique type of this interesting insect was taken by me near the lower end of Fallen Leaf Lake July 17. Its pale surface, closely dotted with round black points, will at once distinguish it from all the allied forms.

Macrotylus lineolatus Uhler. A few examples of this form were beaten from bushes about the lower end of Fallen Leaf Lake late in July.

Macrotylus infuscatus Van D. Taken with the preceding but in greater abundance. Unfortunately I neglected to note the food-plant of these species, but it may have been the willow which grew in several localities about there.

***Microphylellus alpinus*, new species**

Aspect of *Microphylellus rubricans* Prov. but larger and darker; piceous black with castaneous legs. Length 4.5 mm. to tip of membrane.

Head nearly as in *modestus*, a little shorter when viewed from the side; projecting below the eye for scarcely more than the width of the eye. Vertex without a basal carina. First joint of antennae a little shorter than in the type species, surpassing the clypeus by about half its length; second joint linear, distinctly incrassate, as thick as basal joint; third and fourth together about as long as second, setaceous. Pronotum proportionately shorter than in *modestus*; humeral angles slightly prominent, sides feebly sinuated and anterior angles well rounded; callosities large, distinct, the impressed line strongly arched either side; the disk minutely transversely wrinkled, sides subacute but hardly carinate. Rostrum attaining apex of hind coxae, basal joint surpassing base of the head.

Color piceous-black, deeper on the head, pronotum and scutellum; antennae uniformly concolorous; rostrum a little paler. Legs castaneous, becoming piceous on the coxae, on the base of the femora, at least the posterior, and on the tarsi.

Described from one male example taken on the alpine meadows on the western slope of Angora Ridge at an altitude of 8500 feet, on July 26. This species is not typical of genus *Microphylellus*,

differing in the shorter pronotum, more prominent callosities, larger basal joint of the rostrum and the stouter second segment of the antennae.

Microphylellus bicinctus Van D. Taken on the chaparral along the western shore of Fallen Leaf Lake early in July. Apparently rare.

Gerhardiella delicata Uhler. Two examples were beaten from the chinquapin oaks along the western shore of Fallen Leaf Lake late in July. There seem to be no good structural characters by which to distinguish between this genus and certain related genera such as *Psallus*, *Apocreminus* and *Plagiognathus*. By separating out the forms having the femora dotted in longitudinal series and the tibiae dotted with black we have a fairly homogeneous group including the types of the genera *Plagiognathus* and *Gerhardiella*, and I can see no harm in using the latter name for the red forms, as they have quite a different aspect from the more typical forms of *Plagiognathus*. If we do this, it would seem advisable to divide genus *Psallus*, placing those forms with ovate blackish bodies and dotted tibiae in genus *Apocreminus*. It is possible that further study may disclose good structural characters for distinguishing these genera, but I have not yet detected any that seem at all constant.

Apocreminus politus Uhler. Taken about the upper end of Fallen Leaf Lake and at Half Moon Lake in July. This species is smaller and more slender than the more typical *anchorifer* Fieb., but for the present I prefer to place it here rather than in *Plagiognathus*, as it has the black femora and the white scale-like vestiture of *Apocreminus*. In this species the second antennal joint is entirely black.

***Apocreminus nigerrimus*, new species**

Larger than *politus*, deep black, polished, clothed with coarse deciduous white hairs; apical joint of antennae concolorous, tibiae obscurely dotted. Length 3.5 mm. to tip of membrane.

Head about as in *anchorifer*, viewed from the side shorter, with the facial angle more acute; projecting below the eye for a distance equal to the greatest width of the eye. Vertex ecarinate, a little flattened. Antennae hardly shorter than in *anchorifer*; first joint surpassing clypeus by about one-third its length; second as long as pronotum and one-half the head; third and fourth together as long as second. Pronotum rather

long; its length a little more than half its basal width; the sides straight, with the anterior angles scarcely rounded. Rostrum attaining the posterior coxae, first joint reaching base of the head. Oviduct of the female long.

Color deep black, polished above, clothed with conspicuous white hairs; base of vertex with a fulvous sinuate line which (as in *politus*) simulates a carina; third and fourth antennal joints obscure castaneous, their bases narrowly blackish. Tibiae above obscure whitish, bristles and dots at their base black. Membrane almost as deeply colored as the corium, marked with a small pale spot next the tip of the cuneus, invading more or less the apex of the nervures. Osteolar orifice soiled white.

Described from twelve examples representing both sexes. Eight of these were taken by Mr. Fordyce Grinnell at Pasadena, California, June 5, 1909, and four I took about the upper end of Fallen Leaf Lake in July.

***Bolteria picta hirta* new subspecies**

Smaller and darker-colored than *picta*, clothed with stiff black hairs; dull yellowish-green, most of the head, two transverse bands on the pronotum, scutellum in part, inner margins of the clavus, a broad distal vitta on the corium, an oval spot on the cuneus and most of the lower surface black; femora dull fulvous, marked with large fuscous dots in longitudinal series. Length 4 mm.

Head shorter and less prominent than in *picta*. Vertex a little depressed before the base, which is thickened but hardly carinate. Front convex, polished. Antennae shorter than in *picta*; first segment but little surpassing the clypeus; third and fourth together subequal to second. Pronotum, scutellum and elytra as in *picta*, impunctate, polished, clothed with stiff black hairs which are somewhat longer and more dense on the head. Rostrum attaining the intermediate coxae.

Color a soiled greenish-yellow. Head polished black; a point next the inner angle of the eye and base of the vertex fulvous, median line of the front sometimes pale. Antennae and rostrum black, extreme apex of first antennal joint pale. Pronotum marked with a broad transverse band on the callosities and a narrower one on the hind margin, black. Incised line on scutellum black. Narrow scutellar and commissural margin of clavus, a broad longitudinal vitta on corium, a short mark within the costa placed near the apex and a large oval spot covering the disk of the cuneus, black. Membrane infuscated, a cloud in the apical areole and a curved ray beyond deeper black. Beneath black, polished, osteolar region and the lower margin of propleura whitish. Legs obscure fulvous, femora infuscated at base and apex and dotted with blackish in longitudinal series; tibial bristles black springing from small black points.

Described from eight female examples beaten from sagebrush (*Artemisia*) on the shore of Fallen Leaf Lake near the Lodge

on July 5. Typical examples of *Bolteria picta* Uhler received from Mr. Heidemann show but few black hairs and they seem to be entirely wanting from specimens taken by me on the plains about Denver, Colorado.

HOMOPTERA

Okanagana rimosa Say. Common at all levels from Fallen Leaf Lake up to 8500 feet on Angora Ridge, the first individuals appearing on July 3. This species has the habit of resting in trees fifteen or more feet above the ground, and being wary are very difficult to capture.

Okanagana ornata Van D. On July 11 I took from low oak bushes growing on the top of the lateral moraine east of Fallen Leaf Lake three male examples of a form agreeing entirely with *ornata* except that the orange colors are replaced with pale testaceous. Possibly the local conditions might account for this difference in color or these specimens may not have been fully colored.

Aphrophora permutata Uhler. Common at lower levels and first reaching maturity about July 15.

Stictocephala pacifica Van D. Not uncommon about Fallen Leaf Lake during July.

Telamona barbata Van D. On July 30 I took numbers of what may prove to be this species from a willow having pale green foliage, growing on the southern slope of Mount Tallac. These have the crest more erect and elevated than the types from New York State.

Telamona obsoleta Ball. One example of this form was beaten from a willow near Glen Alpine Springs, July 22.

Orgerius rhyparus Stål. Two fully grown examples were taken near the lower end of Fallen Leaf Lake July 17.

***Elidiptera woodworthi*, new species**

Closely allied to *septentrionalis*; broader, more mottled with white; front whitish with its base and the clypeus fulvo-testaceous. Length 7 mm.

Vertex a little shorter than in *septentrionalis*, scarcely as long as broad, the impressed median line almost obsolete in the female. Front a little narrower than in the allied species, sides almost rectilinear, at apex curving inward to base of clypeus. Pronotum as in *septentrionalis*, narrowly produced to about the middle of the eyes and truncate at apex.

Elytra broad as in *variegata* and *pallida*. Rostrum reaching to apex of penultimate ventral segment. Hind edge of genital segment feebly arcuated in the female, quite deeply notched in the male, leaving a conspicuous lobe or tooth at the lower angle next the ventral insicure; dorsal plate of the male long and triangular at apex. In the male of *septentrionalis* the genital segment is truncated, without a ventral notch, and the dorsal plate is short and truncated, not exceeding the plates.

Color fulvo-testaceous, becoming more gray on vertex and pronotum; elytra milky-white with pale nervures, varied with testaceous-brown and dotted with fuscous, the brown forming a longitudinal series of three squarish patches on each elytron, the anterior two sometimes obscurely united by a brownish cloud along the claval suture; inner apical cells mostly brown crossed by white nervures and veinlets; the fuscous dots arranged along nervures and on costal margin, where they form two irregular marks before the apical areoles. Wings infuscated at apex. Pronotum irrorate with brown, the fulvous mesonotum more obscurely so. Beneath and legs almost uniformly fulvo-testaceous with a dark lateral vitta covering the eye and shading below to black with the extreme edge of the inferior aspect of the pronotum clear white. Front whitish, with the base to a little below the upper angle of the eye darker and irrorate with brown. Edges of the pleural pieces and ventral segments whitish.

Described from numerous examples taken on the Jeffrey pine, especially along the southern slope of Mount Tallac, after July 19. They were also beaten from cypress bushes growing on this same slope and here the young were taken with the adults. This is of a clearer gray than any of our other species of *Elidiptera*. It has much the aspect of the eastern *variegata* but that is a larger and darker form with a shorter vertex. In my key of 1907 it runs directly to *septentrionalis* but may be distinguished from that form by its more whitish aspect, broader form, the mostly pale front and the different genital characters.

***Catonia nemoralis*, new species**

Size and aspect of *grisea*, to which it is closely related; ashy gray with the elytra irrorated and mottled with fuscous and dotted with white veinlets, the front uniformly whitish-testaceous. Length 5 mm.

Vertex short, truncate, broader than in *grisea*, not as long as width of each compartment. Pronotum at the middle scarcely as long as vertex. Mesonotum shorter than in *grisea*, about twice length of vertex and pronotum together (in *grisea* three times as long). Front broader than in *grisea*, but little wider toward clypeus. Last ventral segment of the male truncated, with a subacute triangular median tooth about one-third the length of the valves, while in *grisea* it is nearly half their length. Plates oblong, a little narrowed at apex.

Color of head, pronotum and mesonotum fulvo-testaceous, becoming more brown on mesonotum, where the dark irrorations are more conspicuous. Pronotum darkened either side of the median carina, with about four brown points behind each eye; vertex sometimes showing dark irrorations. Elytra testaceous-gray with a tinge of brown and marked with two obscure transverse brown bands, one, more distinct, at the basal third, the other at the apex of the clavus, the costa with a narrow fuscous line; all the nervures, including the costal, pale, slenderly edged with fuscous and broken by numerous white transverse veinlets. Wings fuscous at apex with darker nervures. Front and clypeus whitish-testaceous, immaculate or nearly so. Pectus and legs brown, inferior aspect of pronotum testaceous, knees, tips of the tibiae and tarsi pale. Abdomen black, white-pruinose, the slender edges of segments and genital pieces pale. Antennae brown, the setae black.

Described from numerous examples taken June 20 to the last of July from the level of Lake Tahoe up to 8000 feet. This species seems to live entirely on the lodge-pole pine, although it was occasionally captured on other trees whence it had evidently flown from the pines.

Catonia succinea, new species

Form and aspect of *majusculus*; a little smaller and nearly immaculate but closely allied to it in most of its characters; pale amber-brown above, almost white beneath. Length 6 mm.

Vertex distinctly longer than in *majusculus*, passing the eye by about one-fourth its length, anterior edge parabolic and obviously carinate; median carina prominent, abbreviated before; hind edge almost truncate. Pronotum shorter than vertex, carinae prominent. Mesonotal carinae sharp, feebly arcuate at apex. The closed elytra almost parallel, a very little wider toward their apex. Front narrower than in *majusculus*, not obviously wider at apex, carinae prominent. Last ventral segment of the male truncate at apex, without a median tooth, plates contiguous at base, oblong, oblique at apex.

Color a uniform obscure amber-brown, quite strongly tinged with fulvous on mesonotum; surface of the elytral areoles subhyaline and beautifully green-iridescent when closed over the wings. Beneath whitish, tinged with fulvous or amber on the front, clypeus, mesopleura and apex of the tarsi; lateral carinae of the front pale.

Described from twelve examples, representing both sexes, taken about the upper end of Fallen Leaf Lake and along Glen Alpine Creek during July. Most of these I beat from cypress bushes and that probably is the native food-plant of the species.

Oliarus fidus Van D. One pair taken near Glen Alpine Creek in July. These are a little larger and darker than those from San Diego County but do not seem to differ otherwise.

Cixius basalis Van D. Not uncommon during July about Fallen Leaf Lake and at Half Moon Lake. This species has been taken in the Selkirk Mountains in British Columbia and in Colorado, and is common in the northeastern states and Canada.

Laccocera obesa Van D. Several females were found on the flats at the lower end of Fallen Leaf Lake, July 17.

Liburnia magnifrons Crawf. Taken with the preceding.

Liburnia sp. A species near *osborni* was very abundant on a marshy meadow near the Angora Lakes at an altitude of 7200 feet.

Koebelia californica Baker. Abundant on lodge-pole pine. They began reaching maturity about July 12 and by the last of the month few nymphs were seen.

Koebelia irrorata Ball. One pair was taken with the preceding on July 22. It is larger, with a longer vertex, and is paler in color and less mottled, and the genital characters are distinct.

Oncopsis variabilis Fitch. On alders about the upper end of Fallen Leaf Lake, July 5 to 19. These are all pale yellow or testaceous and are without the oblique elytral vitta. One male does not differ from the female in color.

Oncopsis pruni Prov. Two males taken at Half Moon Lake and one near Cathedral Lake, July 5.

Idiocerus amoena Van D. Taken at the lower levels during July.

Agallia californica Baker. Angora Lake, June 22, and Fallen Leaf Lake, July 16.

Helochara communis Fitch. Lower end of Fallen Leaf Lake, not uncommon.

Xerophloea viridis Fabr. One large rather gray specimen was taken with the preceding.

Gypona angulata Spangb. A single specimen taken near Glen Alpine Springs, July 12.

Errhomenellus maculatus G. & B. Two young and two adults of what I believe to be this species were taken along the Tallac short trail, July 5.

Parabolocratus viridis Uhler. Several were found near the sawmill at the lower end of Fallen Leaf Lake, July 17.

Aligia jucunda Uhler. Beaten from chinquapin oaks on the western shore of Fallen Leaf Lake, July 5.

Aligia inscripta Van D. Taken with the preceding and on the southern slope of Mount Tallac.

Deltocephalus affinis G. & B. Flats at lower end of Fallen Leaf Lake, July.

Deltocephalus vanduzeei G. & B. Not uncommon on the low lands and on the meadow near the Angora Lakes.

Deltocephalus punctatus O. & B. Two taken near Fallen Leaf Lake. This seems to be scarcely more than a pale form of *fuscinervosus*.

Phlepsius ovatus Van D. Taken at the lower end of Lake Tahoe, July 17.

Phlepsius occidentalis Baker. Lower end of Fallen Leaf Lake, July 25.

Euscelis exitiosus Uhler. Common up to 7500 feet.

Euscelis striolus Fall. One example was taken on the meadows near the Hotel Tallac, July 31.

Thamnotettix geminata Van D. Common about the lower end of Fallen Leaf Lake in July.

Thamnotettix longiseta Van D. Two examples taken with the preceding.

Cicadula laeta Uhler. One pair taken with the foregoing, July 17.

Cicadula sexnotata Fall. Abundant about the Angora Lakes, Half Moon Lake and Grass Lake. Here as elsewhere it lives on fine grasses growing near water or in damp situations.

Balclutha impicta Van D. Two females were taken in a swampy meadow at the foot of Angora trail in July.

Eugnathodus abdominalis Van D. Not uncommon in fields about Hotel Tallac during July.

Dicraneura carneola Stål. Abundant in a swampy meadow near the Angora Lakes and more rarely in grassy places about Fallen Leaf Lake and Grass Lake.

Empoa commissuralis Stål. Near Glen Alpine Creek, three examples.

Aphalara calthae Linn. Beaten from chaparral along the western shore of Fallen Leaf Lake in July.

Euphyllura arbuticola Crawf. Three examples taken with the preceding.

Euphyllura nevadensis Crawf. Common on *Ceanothus* with the preceding.

Transmitted March 20, 1916.

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July 20, 1917

APHIDIDAE OF CALIFORNIA

NEW SPECIES OF APHIDIDAE AND NOTES FROM
VARIOUS PARTS OF THE STATE, BUT CHIEFLY
FROM THE CAMPUS OF THE UNIVERSITY
OF CALIFORNIA, BERKELEY,
CALIFORNIA

BY

E. O. ESSIG

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¹ This paper is No. XI in the author's series "Aphididae of California," published in the *Pomona Journal of Entomology and Zoology*.

INTRODUCTION

California offers a specially inviting field for the study of the *Aphididae* not only because of the comparatively large number of new species yet undescribed, but also because of the great and varied adaptations constantly going on to the everchanging vegetation at the hand of man. The campus of the University of California with its many native plants growing under perfectly natural conditions and the hundreds of introduced species, together with numerous parks such as Golden Gate Park, San Francisco, furnish large and excellent fields for study and investigation. In such environment there are not only many new species of insects to be had, but there are the constant changes of food plants and distribution of old and well known species. The material at hand was taken under such conditions and represents but a small part of a season's work. Unless otherwise specified the data was taken in the field by the writer.

DESCRIPTION OF NEW SPECIES

***Myzocallis arundinariae*, n. sp.**

1. Davidson, W. M., Jour. Econ. Ent., vol. 2, p. 301, 1909, *Callipterus arundicolens* (Clarke).
2. Essig, E. O., Pom. Coll. Jour. Ent., vol. 4, no. 3, p. 762, 1912, *Myzocallis arundicolens* (Clarke).
3. Essig, E. O., Inj. & Ben. Ins. Cal., ed. 1, p. 83, 1913, fig. 65, *Myzocallis arundicolens* (Clarke).
4. Davidson, W. M., Jour. Econ. Ent., vol. 7, pp. 129-130, 1914, fig. 2, *Eucallipterus arundicolens* (Clarke).
5. Essig, E. O., Inj. & Ben. Ins. Cal., ed. 2, p. 84, 1915, fig. 67, *Myzocallis arundicolens* (Clarke).

During the year 1911 the writer received from Mr. C. W. Beers, Horticultural Commissioner of Santa Barbara County, a few leaves of bamboo taken at Carpinteria, California, and infested with a yellow and black plant louse which agreed so well with the description of *Callipterus arundicolens* (Clarke)² that it was unquestionably listed as that species. The same insect was taken and received by the writer from a number of localities throughout the state since that time, but it was not until the past year, when a close study of the species described by Professor

² Can. Ent., vol. 35, p. 249, 1903.

Clarke was made in the type locality at Berkeley, that it was discovered that the former insect had some marked and constant characters not common to the latter and that the differences were sufficient to separate the two. The former has therefore been described as a new species, *Myzocallis arundinariae* from the generic name of the bamboo most commonly infested. Only the winged viviparous females—virgogeniae—could be secured, though the writer made a special trip to Sacramento where he had previously taken the species, and enlisted aid from all pos-



FIG. 1. *Myzocallis arundinariae*, n. sp. Winged viviparous female. A, adult; B, lateral aspect of head showing protuberance; C, cornicle; D, cauda and anal plate; E, lateral view of the dorsum of the abdomen showing dark tubercles and cauda; F, and G, antenna. (Original.)

sible sources in the attempt. The apparent absence of sexuales is also in contrast to *Myzocallis arundicolens* (Clarke) which had an abundance at this time.

WINGED VIVIPAROUS FEMALE—VIRGOGENIA

The color varies from whitish to pale yellow with noticeable black markings and bright red compound eyes. The average length is 1.4 mm. and the width near the base of the abdomen 0.4 mm. The head is often slightly dusky and has two lateral and a dorsal longitudinal black vittae. The antennae (fig. 1,

F, G) are yellow and black and often covered with a white fluffy material giving a bluish cast to the black beneath. Articles I, II and VI are dusky, while all of III excepting the middle is black and IV and V are black at the extreme bases and the apices. The length of the antennae is more than twice that of the body; that of the respective articles being: I 0.1 mm., II 0.08 mm., III 0.98 mm., IV 0.65 mm., V 0.58 mm., VI 0.64 mm. (base 0.29 mm., filament 0.35 mm.), total 3.03 mm. The sensoria are transversely oval and variable in size, but the majority are about equal in length to half the width of the article. On Article III there are from four to nine confined to the basal third. The following tabulation will give an idea of the number on the pairs of antennae of forty-four individuals, the colon separating the individuals and the comma the articles, 7, 7: 6, 5: 5, 5: 6, 6: 7, 9: 7, 7: 6, 6: 5, 5: 5, 5: 5, 5: 7, 8: 8, 8: 7, 8: 7, 8: 6, 6: 7, 9: 7, 7: 6, 8: 6, 7: 6, 7: 4, 5: 6, 6: 6, 5: 5, 7: 6, 7: 5, 5: 6, 7: 4, 7: 4, 5: 6, 7: 5, 7: 4, 6: 5, 5: 5, 5: 5, 6: 5, 6: 6, 7: 5, 6: 6, 7: 6, 6: 6, 6: 6, 7: 5, 6: 6, 7. The usual number occur on articles V and VI. There are but few very inconspicuous hairs on the antennae. A very large protuberance is located on the underside of the head just in front of the rostrum (fig. 1, *B*) which it equals in length. The rostrum is very short, reaching only to the front coxae. The thorax is yellow with amber or slightly dusky muscle lobes and a dark vitta on each side in front of the bases of the wings and two indistinct dusky lines on the dorsum. The venation of the wings is shown in the accompanying drawing (fig. 1, *A*). The legs are yellow with the apical portions of the tarsi dusky. The abdomen has two longitudinal rows of dorsal tubercles (fig. 1, *A, E*); there being eight separate pairs and one large patch made by the fusing of the ninth pair. A small hair or spine arises from each of the dark areas and two from the largest posterior one. The cornicles (fig. 1, *C*) are yellow, short and much wider at the base than at the mouth. A very long hair arises from a tubercle near the middle of the hind margin. The length is 0.1 mm. The cauda (fig. 1, *D*) is knobbed and conspicuously dusky or black. The anal plate (fig. 1, *D*) is distinctly bilobed and pale or dusky yellow.

The nymphs are pale yellow or very bright amber in color and covered with numerous long knobbed spines or hairs.

HOSTS, LOCALITIES, DATES AND COLLECTORS

1. Bamboo, *Arundo*, sp., Stanford University, Cal., October, 1908?
W. M. Davidson.³
2. Bamboo, *Arundinaria*, sp.?, Carpinteria, Cal., July 20, 1911. C.
W. Beers.
3. Bamboo, *Arundo*, sp., San José, Cal., Oct. 15, 1911. W. M.
Davidson.
4. Bamboo, *Arundinaria japonica* S. & Z., Capitol Park, Sacramento,
Cal., April 30, 1912. The writer.
5. Bamboo, *Arundo*, sp.?, Exposition Park, San Diego, Cal., April
27, 1916. A. F. Swain.
6. Bamboo, *Arundinaria*, sp.?, Montecito, Cal., June 27, 1916. C.
W. Beers.
7. Bamboo, *Arundinaria japonica* S. & Z., Capitol Park, Sacramento,
Cal., Dec. 14, 1916. The writer.

The writer has also had reports of its occurrence elsewhere in Southern California but has not been able to verify them.

In all cases the insects work on the leaves, usually the undersides, and produce sufficient honey-dew to cause considerable smutting.

COTYPES

All of the descriptions made by the author have been from a series of individuals which of course become cotypes. These have been placed in the collections of the U. S. National Museum, Washington, D. C., and the California Academy of Sciences, San Francisco, Cal., while a good series in each case has remained in the author's collection. In case of the species herein described they have been deposited as directed above.

***Myzocallis arundicolens* (Clarke)**

WINGED VIVIPAROUS FEMALE—VIRGOGENIA

1. Clarke, W. T. (orig. desc.), Can. Ent., vol. 35, p. 249, 1903,
Callipterus.
2. Essig, E. O. (host index), Pom. Coll. Jour. Ent., vol. 3, no. 2,
p. 458, 1911, *Callipterus*.
3. Essig, E. O. (list), Pom. Coll. Jour. Ent., vol. 4, no. 3, p. 263,
1912.

The color of the winged viviparous female is from whitish to pale lemon-yellow with bright red compound eyes, a pitch

³ The writer received a mounted slide of specimens taken by Mr. Davidson at San José, California, which proved to be this species. These specimens are probably the same as those which he also took at Palo Alto as recorded above.

black cauda and black or dusky antennal markings. It very much resembles the corresponding form of the preceding species in size, color and shape, but lacks the black tubercles on the dorsum and has the sensoria on article III of the antennae grouped about one-third the distance from the base instead of being confined to the basal third (fig. 2, *D*). The number of sensoria is also smaller as will be seen from the following tabulation of thirty-one individuals 6, 6:7, 7:5, 5:6, 8:4, 5:4, 4:5,

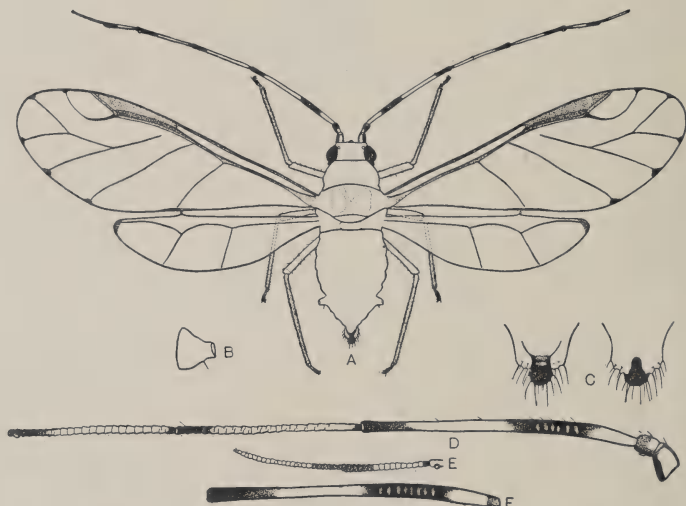


FIG. 2. *Myzocallis arundicolens* (Clarke). Winged viviparous female. *A*, adult; *B*, cornicle; *C*, cauda, and anal plate; *D* and *E*, antenna; *F*, article III of the antenna of a sexupara.

6:5, 6:5, 6:6, 6:5, 5:6, 6:5, 6:6, 6:7, 8:5, 6:5, 6:6, 7:5, 6:6, 6:4, 6:6, 6:6, 6:5, 6:5, 6:6, 6:5, 6:5, 6:5, 6:6, 8:6, 7. The stigma of the wings usually lack the darker spots at the base which is so constant in *Myzocallis arundinariae*, and the cauda is usually blacker.

SEXUPARA

Fig. 2, *F*

The sexupara is very much like the virgogenia, but is usually a little larger. There are also more sensoria on article III of the antennae (fig. 2, *F*) as shown by the following tabulation of eighteen individuals: 7, 8:10, 10:7, 7:8, 9:6, 9:8, 9:6, 10:7, 8:8, 9:7, 9:8, 9:8, 9:9, 10:8, 9:8, 8:7, 10.

SEXUALES

FEMALE

The sexual female is large, robust and apterous, varying from whitish to very pale yellow and immaculate excepting the dark patches on the antennae and tarsi as well as the pitch black cauda. The length averages 2mm. and the width 1.3 mm. The dorsum has four longitudinal rows of hair-like spines which arise from quite large tubercles. The antennae (fig. 3, *C*, *D*) are longer than the body, the individual articles being as follows: I 0.11 mm., II 0.07 mm., III 0.9 mm., IV 0.57 mm., V 0.5 mm., VI 0.66

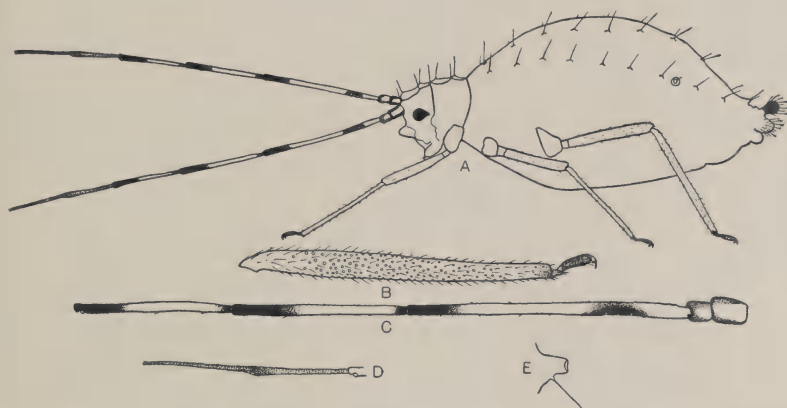


FIG. 3. *Myzocallis arundicolens* (Clarke). Sexual female. *A*, side view; *B*, hind tibia showing sensoria; *C* and *D*, antenna; *E*, cornicle. (Original.)

mm. (base 0.31 mm., filament 0.35 mm.), total 2.81 mm. The sensoria are transversely oval and similarly located as in the other forms, but are fewer in number, varying from none at all to three or four. The hind tibiae (fig. 3, *B*) are swollen and covered with a great many small circular sensoria.

EGGS

The eggs are pale yellow or whitish when first laid, but soon become shining black. They are oval with a conspicuous blunt stipe or pedicel at one end. The length averages 0.07 mm. They are deposited singly, in uneven masses or more often in rows on the undersides of the leaves and are at once conspicuous to the naked eye.

MALE

The male is winged and much darker in color than any of the other forms. The average length is 1.5 mm. The head and articles I, II and VI of the antennae are dusky, while article III is almost black throughout, the apical half of IV is also black



FIG. 4. *Myzocallis arundicolens* (Clarke). Eggs. The pale ones are freshly laid and become black soon afterwards. Three are greatly enlarged to show the pedicel at one end. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

and V is a little darker than VI. The antennae (fig. 5, *B-E*) are much longer than the body, the lengths of the respective articles being: I 0.07 mm., II, 0.07 mm., III 0.93 mm., IV 0.58 mm., V 0.48 mm., VI 0.68 mm. (base 0.31 mm., filament 0.37 mm.), total 2.81 mm. The sensoria are transversely oval and numerous on

article III, numbering from 21 to 30 and covering the entire length excepting the extreme base. On article IV there are from 3 to 8 which are usually confined to the apical two-thirds of the joint. On article V there are from 2 to 9 distributed indefinitely along the entire length. There are from 1 to 6, not including those in the process, on article VI located usually near the middle of the base. The following tabulation, which does not include the sensoria in the process of VI, will serve to give an idea of the variation in numbers on the respective articles:



FIG. 5. *Myzocallis arundicolens* (Clarke). Male. A, dorsal aspect; B E, antennae. (Original.)

Individuals	III	IV	V	VI
1	27	3	8	2
	26	4	8	2
2	29	5	9	3
	26	6	5	3
3	25	7	6	2
	25	4	6	6
4	21	8	5	2
	25	4	6	5
5	26	3	5	3
	26	7	6	3
6	28	5	2	2
	25	6	4	2

Individuals	III	IV	V	VI
7	26	3	9	3
	28	6	7	3
8	28	6	8	article missing
	30	3	7	2
9	24	4	7	article missing
	29	7	8	article missing
10	24	4	5	article missing
	26	5	8	article missing
11	25	4	6	1
	26	5	7	2

The legs are quite long, dusky yellow with almost black femora which have rather prominent oval or circular pale areas showing specially well in the mounted specimens. The thorax is yellow or dusky with brown or black muscle lobes. The abdomen is yellow with black spots along the margins and numerous black patches on the dorsum usually arranged in transverse rows. The cornicles are short and dusky yellow. The cauda and anal plates are from dusky to pitch black. Short spines arise from the dusky areas on the dorsum, being arranged in longitudinal rows.

HOST PLANTS, LOCALITIES, DATES AND COLLECTORS

1. Bamboo, *Arundo*, sp.,⁴ Berkeley, Cal., 1903. W. T. Clarke.
2. Bamboo, *Arundinaria japonica* S. & Z., U. C. Campus, Berkeley, Cal., 1916. Different forms taken by the writer as follows:

Virgogeniae—Abundant on the undersides of the leaves throughout the summer and fall. Those described were collected on June 1 and July 17.

Sexuparae—Quite numerous in the late fall. Collected Nov. 28 and 29 and Dec. 28.

Sexuales—The females abundant from the last of October to the first of December and a few stragglers remaining until after January 1. Collected Nov. 28 and 29 and Dec. 28. The males not abundant at any season, but most numerous about the middle of November. Collected Nov. 28, and 29. None were to be found as late as Dec. 28.

Eggs were laid the last of October and a few still being deposited in late December, but on Dec. 28 very few freshly laid eggs could be found, practically all having already assumed the shiny black color.

⁴ This plant is undoubtedly *Arundinaria japonica* S. & Z., which is the common species infested on the campus where the type specimens were also taken.

***Symydobius*⁵ *agrifoliae*, n. sp.**

This species was first collected by S. H. Essig and the writer in 1911, but as only apterous forms were secured at that time no attempt was made to describe it. During the spring of 1916 a number of winged and apterous viviparous females were taken by S. H. Essig and forwarded to the writer. As previously believed it proved to be a new species, which I am naming after the species of the host plant. It is with gratitude here that I acknowledge the great help constantly given by my brother mentioned above.



FIG. 6. *Symydobius agrifoliae*, n. sp. Apterous viviparous female. A, dorsal aspect; B, cauda and anal plate; C, cornicle; D, antenna. (Original.)

APTEROUS VIVIPAROUS FEMALE—VIRGOGENIA

The mature apterous female is rather robust and of a dark reddish brown color with lighter amber or yellowish markings describing roughly the letter Y on the back. The dorsum and sides are also obscurely marked with black blotches. The length averages about 1.6 mm., and the greatest width is 1.1 mm. The head is rather narrow and pale amber at the bases of the antennae. The eyes are dark red. The antennae (fig. 6, D) are

⁵ The genus *Symydobius* has been wrongly spelled *Symdobius* in the author's former articles.

dusky with the greater portion of article III and the bases of articles IV and V pale. The length is nearly as great as that of the body, the measurements of the respective articles being: I 0.08 mm., II 0.07 mm., III 0.41 mm., IV 0.3 mm., V 0.26 mm., VI 0.16 mm. (base 0.13 mm., spur 0.03 mm.), total 1.28 mm. There is considerable variation in the measurements of different individuals, but the relative lengths are fairly constant. The usual sensoria are present on articles V and VI, but very few hairs are present on any of the articles. The rostrum is light amber in color and reaches slightly beyond the third coxae. The legs are rather short and dark brown with lighter areas in the middle of the tibiae of most specimens. The cornicles (fig. 6, *C*) are dark, very short, wide at the base and narrow at the mouth, which has a very wide lip or flange and small opening. The cauda (fig. 6, *B*) is dark, broad at the base with a rounded tip and normally hairy. The anal plate (fig. 6, *B*) is dark, rounded and has a small but distinct incision or notch in the middle.

The nymphs are slightly paler in color than the mature forms.

WINGED VIVIPAROUS FEMALE—VIRGOGENIA

The winged forms are dark reddish brown with black markings. The length averages 1.9 mm., and the greatest width 1 mm. The head is light or very dark reddish brown. The antennae (fig. 7, *C*) are dusky or black with the greater portion of article III and the basal halves of IV and V pale yellow or amber. They are about three-fourths the length of the body, the measurements of the respective articles being: I 0.1 mm., II 0.07 mm., III 0.44 mm., IV 0.3 mm., V 0.28 mm., VI 0.18 mm. (base 0.13 mm., spur 0.05 mm.), total 1.37 mm. There are from four to eight large and small circular sensoria on article III. Of fourteen antennae examined to ascertain the number of sensoria on article III it was found that but one had 4 sensoria, three had 5, six had 6, two had 7, and two had 8. Articles V and VI have the usual sensoria. The rostrum is amber in color and reaches to the third coxae. The thorax is reddish brown with very dark brown or black muscle lobes. The wings are subhyaline with distinct dusky bordered veins. The venation is shown in the accompanying drawing (fig. 7, *A*). The legs are dark with lighter areas in the middle of the tibiae. The abdomen is reddish brown with one or two rows of dark or black markings near the margins from

which arise short spines. The dark areas increase in size towards the posterior end. The cornicles (fig. 7, *B*), the cauda and the anal plate are much the same as in the apterous form already described.

HOST PLANTS, LOCALITIES, DATES AND COLLECTORS

This species feeds in compact colonies on the bark and very rarely on the leaves of the coast live oak, *Quercus agrifolia* Nee. As already stated apterous forms were first taken by S. H. Essig

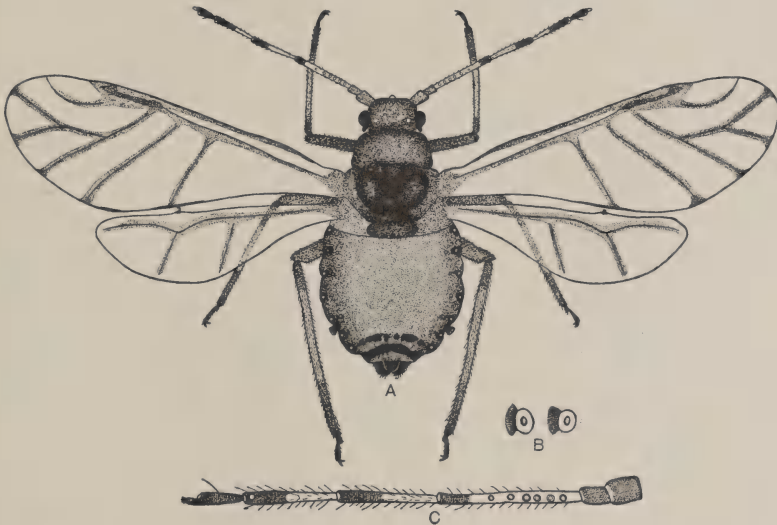


FIG. 7. *Symydobius agrifoliae*, n. sp. Winged viviparous female. *A*, dorsal aspect; *B*, cornicles; *C*, antenna. (Original.)

and the writer in Santa Paula Cañon, near Santa Paula, California, on July 21, 1911. Apterous forms as well as winged were also taken by the former collector in the same locality on May 27, 1916, as well as along the Ventura River near Ventura, California, on June 21, 1916.

Symydobius agrifoliae, n. sp. is closely related to *Symydobius albasiphus* Davis, but is at once separated by having a much shorter spur on the sixth antennal article as well as other differences.

Myzus aquilegiae*, n. sp.*APTEROUS VIVIPAROUS FEMALE—VIRGOGENIA**

The apterous female is very pretty, being of a pinkish or reddish color with a very large dark brown or nearly black irregular blotch on the middle of the back. The body is of medium size, beset with short knobbed hairs and averaging 1.7 mm. in length and 0.7 mm. in width. The antennae (fig. 8, *F*, *G*) arise from definite but short frontal tubercles (fig. 8, *B*),



FIG. 8. *Myzus aquilegiae*, n. sp. Apterous viviparous female. *A*, dorsal aspect; *B*, head and frontal tubercles; *C*, cornicle; *D*, cauda; *E*, tarsus; *F*-*G*, antenna. (Original.)

are slightly longer than the body, dusky throughout excepting the base of article III, imbricated and supporting a number of knobbed hairs. The lengths of the respective articles are: I 0.09 mm., II, 0.07 mm., III 0.5 mm., IV 0.4 mm., V 0.33 mm., VI 0.63 mm. (base 0.1 mm., filament 0.53 mm.), total 2.02 mm. The sensoria are circular and of various sizes. On article III they are distributed throughout the length, but are much more numerous near the middle. On IV there are usually none, but one or two may sometimes occur. The usual number may be found on V and VI. The following tabulation gives the variation found on articles III and IV from eighteen individual females:

Number	Article III	Article IV	Number	Article III	Article IV
1	26	3	10	18	0
	30	4		15	0
2	26	1	11	20	0
	26	0		24	0
3	19	0	12	12	0
	22	1		14	0
4	17	0	13	16	0
	16	0		11	0
5	18	0	14	14	0
	14	0		12	0
6	11	0	15	26	2
	13	0		25	0
7	17	0	16	13	0
	21	1		12	0
8	22	0	17	10	0
	18	0		15	0
9	16	0	18	19	0
	14	0		23	2

The rostrum is pale with dusky tip and reaches slightly beyond the third coxae. The legs are pale yellow with the apices of the tibiae and all of the tarsi dusky. The tarsi (fig. 8, *E*) are very small. The abdomen is yellowish, pinkish or reddish in color with a large brown or black patch on the dorsum and a marginal row of small dark spots on the sides. The large dorsal dark patch may in some cases cover all of the dorsum excepting the extreme base and the area behind the cornicles. The cornicles (fig. 8, *C*) are whitish or yellow, faintly imbricated, nearly cylindrical, with slightly wider base and small flare at the mouth. The length averages 0.47 mm., or about three times the length of the hind tarsi. The cauda (fig. 8, *D*) varies from yellowish to pale pink or reddish, is gradually pointed and about two-thirds as long as the cornicles.

WINGED VIVIPAROUS FEMALE—VIRGOGENIA

The winged viviparous female is yellow or reddish with a number of dark brown or black markings over the body. The length averages 1.4 mm., and the width 0.45 mm. The body is sparsely covered with simple and knobbed curved spines. The head is black and the compound eyes red. The antennae (fig. 9,

F, G) arise from small, but distinct frontal tubercles (fig. 9, *B*), are black throughout with few knobbed hairs. The length is greater than that of the body, the respective articles measuring: I 0.07 mm., II 0.06 mm., III 0.52 mm., IV 0.4 mm., V 0.36 mm., VI 0.8 mm. (base 0.12 mm., filament 0.68 mm.), total 2.21 mm. The sensoria are circular, of various sizes and numerous on articles III, IV and V, with the usual ones in the process of VI. The number varies considerably on the different articles, as the following tabulation will show:

Number	Article III	Article IV	Article V	Number	Article III	Article IV	Article V
1	24	0	0	8	34	17	8
	26	1	0		31	18	6
2	30	21	4	9	34	21	5
	36	16	9		37	16	8
3	31	18	5	10	42	23	3
	32	17	9		38	18	4
4	44	23	3	11	34	14	5
	42	23	2		32	16	5
5	38	19	6	12	24	15	5
	35	23	8		27	14	3
6	35	19	5	13	26	11	6
	29	15	3		23	16	6
7	33	16	3	14	38	14	9
	34	19	5		34	18	5

The rostrum is pale with the apical half dusky and reaches slightly beyond the third coxae. The thorax is black with reddish areas at the sides and between the segments. The wings are normal in length with brownish veins and stigma. The venation is shown in the accompanying drawing (fig. 9, *A*). The legs are nearly all black, excepting the middle of the tibiae and the bases of the femora. As in the apterous form the tarsi (fig. 9, *E*) are exceptionally small. The abdomen is reddish with small irregular dark markings on the sides and dorsum. The cornicles (fig. 9, *C*) vary from pale dusky to black, slightly imbricated, cylindrical with a slightly flaring mouth. The length is 0.32 mm., or about three times the length of the hind tarsi. The cauda (fig. 9, *D*) is yellow or reddish and about two-thirds the length of the cornicles.

HOST PLANTS, LOCALITY, DATES AND COLLECTOR

A native columbine, *Aquilegia truncata* F. & M., cultivated in the botanical garden on the campus, appears to be the preferred food plant, though a few specimens were found throughout the season on a nearby species, *A. chrysantha* Gray. The small tender shoots and buds are invariably infested and often the plants are considerably injured by the attacks. The species passes the entire year on the columbine, going as far down



FIG. 9. *Myzus aquilegiae*, n. sp. Winged viviparous female. A, dorsal aspect; B, head showing frontal tubercles; C, cornicle; D, cauda; E, tarsus; F G, antenna. (Original.)

around the crown as possible during the winter. The specimens described were collected by the writer on June 27 and July 3, 1916. It was first noticed by the writer in 1914.

G. O. Shinji, a student, tells me that he has taken this species on a wild columbine in Marin County, but I have not seen his material to verify the same.

***Aphis cari*, n. sp.**

A small plant louse occurring in compact colonies on the stems of the common sweet or wild anise, *Carum kelloggii* Gray,

was of considerable interest to me when first taken because of the characteristic and beautiful coloring. A few specimens were also taken on *Angelica tomentosa* Wats, which led me to believe that the species might be *Aphis angelicae* Koch, reported as occurring in this state by H. F. Wilson,⁶ but a microscopic examination at once proved it to be widely different from the species described by Wilson. Not being able to place it in any published description I have decided to describe it as new and to name it after the genus of what appears to be the favorite host plant.

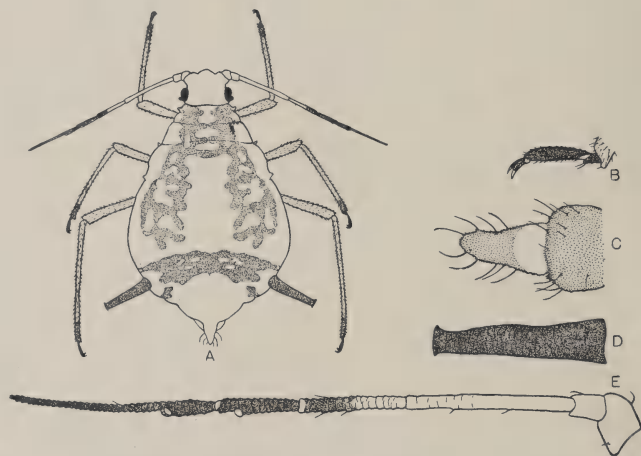


FIG. 10. *Aphis cari*, n. sp. Apterous viviparous female. A, dorsal aspect; B, tarsus; C, cauda; D, cornicle; E, antenna. (Original.)

APTEROUS VIVIPAROUS FEMALE—VIRGOGENIA

The typical apterous viviparous female is transparently white, yellow or pale yellowish green with very noticeable darker green markings on the dorsum and particularly a distinct transverse patch between the bases of the cornicles. The form is robust, the length averaging 1.7 mm. and the width 1.2 mm. The head is usually pale whitish, yellow or pale yellowish green without darker markings. The antennae (fig. 10, E) are whitish or yellow throughout the basal half, the remainder being dusky or black. Most of the articles are distinctly imbricated. The length is about three-fourths that of the body, the lengths of the respective articles being: I 0.06 mm., II 0.04 mm., III 0.32 mm.,

⁶Jour. Econ. Ent., vol. 2, pp. 348-349, Oct., 1909.

IV 0.21 mm., V 0.16 mm., VI 0.36 mm. (base 0.09 mm., filament 0.27 mm.), total 1.15 mm. The usual sensoria occur on articles V and VI with none on III. The rostrum is pale, transparently white and reaches to the third coxae. The prothorax has a large lateral tubercle at the base and on each side of the body a tubercle is located at the unions of the prothorax and mesothorax and the metathorax and abdomen. The legs are normal in length, transparently white with the tips of the tibiae and the tarsi dusky. The cornicles (fig. 10, *D*) are dusky or black, somewhat wider at the base with a medium-sized lip at the mouth, imbricated and



FIG. 11. *Aphis cari*, n. sp. Winged viviparous female. *A*, dorsal aspect; *B*, tarsus; *C*, cauda; *D*, cornicle; *E*, antenna. (Original.)

nearly twice as long as the hind tarsi (fig. 10, *B*), the length being 0.33 mm. and the width at the base 0.09 mm. The cauda (fig. 10, *C*) is dusky, nearly as long as the cornicles, rather slender, with a distinctly wider base for about two-thirds the length when viewed dorsally or ventrally.

WINGED VIVIPAROUS FEMALE—VIRGOGENIA

The winged viviparous female is pale yellowish or greenish with dark green or black head, antennae, thorax, cornicles, apices of the femora, and tibiae and all of the tarsi. The length averages 1.7 mm. and the width 1 mm. The antennae (fig. 11, *E*) are relatively short, reaching only slightly beyond the middle of the abdomen. They are dusky or black throughout and imbricated

ated excepting the basal fourth. The lengths of the respective articles are: I 0.07 mm., II 0.06 mm., III 0.43 mm., IV 0.21 mm., V 0.18 mm., VI 0.41 mm. (base 0.09 mm., filament 0.32 mm.), total 1.36 mm. Article III is covered the entire length with numerous circular sensoria of different sizes. The number varies considerably, from fifteen to fifty, the average being about thirty-five. On article IV of a great many individuals there are no sensoria, while on a few the number varies from one to four. There are the normal number on V and VI. The venation is shown in the accompanying drawing (fig. 11, *A*). The rostrum is dusky and reaches slightly beyond the third coxae. The prothorax has a distinct lateral tubercle on each side of the base. The legs are transparently white or yellow with the apices of the femora and tibiae and all of the tarsi dark. The abdomen is yellow or pale yellowish green with a few darker green markings on the dorsum, and a distinct narrow transverse patch between the cornicles, already referred to. The cornicles (fig. 11, *D*) are nearly cylindrical or with the base somewhat wider than the mouth. They are black or very dark in color, imbricated and about twice the length of the hind tarsi (fig. 11, *B*), the length being 0.25 mm. The cauda (fig. 11, *C*) is much the same as that of the apterous female.

The nymphs vary from pale yellow to faintly yellowish-green with few or no darker markings.

HOST PLANTS, LOCALITIES, DATES AND COLLECTORS

As previously stated this species was first taken on the native wild or sweet anise, *Carum kelloggii* Gray, which appears to be the normal food plant. The insects feed in compact colonies on the stems, usually near a fork and sometimes entirely out of sight beneath the sheath of a leaf petiole. The above infested plants were apparently growing in a wild state along a creek bed in Napa County near the town of Rutherford. Collected by the writer on June 21, 1916.

The second lot, consisting of but few specimens, was taken on the leaves of *Angelica tomentosa* Wats, another native plant growing in the botanical garden on the campus in close proximity to a clump of the wild or sweet anise, which at the particular time showed no infestation. The specimens were collected by the writer on June 27, 1916.

On June 27, 1916, Professor C. W. Woodworth took at St. Helena a plant louse from *Carum kelloggii* Gray which appears to be the same species. The apterous viviparous females, which were the only forms collected, agree in size, shape and coloration, but the cauda is wider and the antennal joints somewhat shorter.

NOTES ON OTHER APHIDIDAE

CHIEFLY FROM THE CAMPUS OF THE UNIVERSITY OF CALIFORNIA,
BERKELEY, CALIFORNIA

Phyllaphis, sp. (fig. 12.) A pale greenish or yellow plant louse which secretes over the body a quantity of white woolly material and which has commonly been called *Phyllaphis querci* Fitch. It is not that species, as has been pointed out by Baker⁷ and is probably not *P. quercifoliae* Gillette.⁸ It occurs in considerable numbers on the undersides of the leaves of the coast live oak, *Quercus agrifolia* Nee., on the campus, but only apterous forms have been secured here thus far. Specimens were received from Altadena, California, August 14, 1916, taken on the same host plant. What also appears to be the same thing was collected at Rutherford, California, June 21, 1916, on valley oak, *Quercus lobata* Nee. The lot included one winged male which agrees very well with Gillette's description of the same sex of *P. quercifoliae*.

Phyllaphis fagi (Linn.). A small yellow and black species densely covered with white woolly material was taken on the undersides of the leaves of *Fagus tricolor* in a lath-house at Oakland, California, July 25, 1916. All forms appear somewhat smaller than specimens which I have under that name in my collection.

Drepanosiphum platanoides (Schrank). A large dark or pale green species infesting the leaves of Norway maple, *Acer platanoides* Linn., and silver maple, *A. saccharinum* Linn., in Berkeley, and neighboring cities. The dark sexual forms are abundant in September and October. This is the commonest species attacking the maple here.

Drepanaphis acerifolii (Thomas). This very pretty insect is gray and black in the winged form and pale yellow in the

⁷ Baker, A. C., Ent. News, vol. 27, p. 361, 1916.

⁸ Gillette, C. P., Ent. News, vol. 25, pp. 274-275, 1914.

apterous, and is at once separated from other closely related species by the large dark tubercles on the back of the winged forms. It has been taken during several successive years and becomes abundant in a few localities. The sexual forms were taken September 16, 1916. The Norway maple, *Acer platanoides* Linn. and the silver maple, *A. saccharinum* Linn. are attacked.



FIG. 12. *Phyllaphis*, sp. Colonies on the undersides of the leaves of the valley oak, *Quercus lobata* Nee. The bodies are entirely covered with the white woolly material. Rutherford, Cal., June 21, 1916. (Original.)

Calaphis betulaecolens (Fitch). A large green species common in certain restricted areas on the European white birch, *Betula alba* Linn. Collected on the campus June 5, 1916.

Euceraphis betulae (Linn.). A large green and black plant louse which is commonest on the birches in this section. It occurs on the leaves of the European white birch, *Betula alba* Linn., the cut-leaved birch, *B. populifolia laciniata* Hort., and the paper or

canoe birch, *B. papyrifera* Marsh. The species is abundant throughout the year and causes much smutting of the trees.

Eucallipterus flavus Davidson. A pale green species of large size taken in few numbers on the old leaves and in abundance on the tender shoots of the white alder, *Alnus rhombifolia* Nutt., in Wildeat Cañon, near Berkeley, California, May 10, 1916.

Eucallipterus tiliae (Linn.). A beautiful yellow and black



FIG. 13. *Myzocallis castaneae* (Fitch). On leaf of a chestnut tree, Campus, Oct. 10, 1916. (Original.)

species with black clouded wings which often becomes very abundant on linden trees, producing quantities of honey-dew and giving the trees a black and offensive appearance. Specimens were taken on the American linden, *Tilia americana* Linn., in Golden Gate Park, San Francisco, California, May 25, 1916, and on white or silver linden, *T. tomentosa* Moench, Berkeley, California, June 17, 1916.

Myzocallis castaneae (Fitch) (fig. 13). A small yellow aphid which has been called this species occurs on hickory and chestnut on the campus and is often in large enough numbers to

cause a general smutting of the trees. Viviparous females occur throughout the spring and summer. Sexual forms were taken on October 10, 1914.

Myzocallis coryli (Goetze). This very small pale yellow species occurs in great numbers on the undersides of the leaves of an introduced hazel or filbert, *Corylus maxima* Mill., growing in the botanical gardens on the campus. The insects secrete quantities of honey-dew and cause severe smutting of the foliage. Collected in great numbers on June 28, 1916, when apparently at its maximum development.

Myzocallis pasaniae Davidson. A yellow species of median size infesting the undersides of the leaves of the tanbark oak, *Pasania densiflora* Oerst., growing on the Campus, June 27, 1916.

Myzocallis quercus (Kalt). This small species varies in color from pale yellow to light green and has four rather conspicuous dark tubercles on the dorsal base of the abdomen. It generally infests a number of deciduous oaks on the campus, including the English oak, *Quercus robur* Linn. Collected October 10, 1914, and June 20, 1916. It was also taken on what appears to be the same oak in Golden Gate Park, San Francisco, California, May 25, 1916. The species was questioned for some years but was recently verified for W. M. Davidson by P. van der Goot and for the author by A. C. Baker. (The recently published paper in *The Entomological News*, vol. 28, no. 2, Feb., 1917, pp. 62-63, plate 7, by G. O. Shinji, a student here, has added to the confusion. He described two species, *Myzocallis essigi* and *M. woodworthi* from *M. quercus* (Kalt.). *M. essigi* is the common forms of *M. quercus* and *M. woodworthi* is the male of the same thing. All of the specimens were taken from the tree from which my specimens of *M. quercus* were taken. Had Shinji submitted his paper to some member of the entomological department as should have been done such an error could have been avoided. Mr. A. C. Baker examined the type slides also and agrees with my determinations. It might be stated here that there are a number of different species on the type slides and it was necessary to have Mr. Shinji designate the type described in each case.—March 1, 1917.)

Myzocallis ulmifolii (Monell). A bright yellow species occurring on the leaves of English elm, *Ulmus campestris* Smith, and other elms at Berkeley, California, September 20, 1916, and at Sacramento, California, July, 1914.

Chromaphis juglandicola (Kalt.). The common small yellow aphid occurring in great numbers on the undersides of the leaves of the cultivated English walnut, *Juglans regia* Linn. It is abundant throughout the state where this tree is grown and often



FIG. 14. *Pterocomma flocculosa* (Weed). Three apterous viviparous females almost hid by the white flocculence. On arroyo willow, *Salix lasiolepis* Benth. Berkeley, Cal., June 15, 1916. (Original.)

causes much smutting of the foliage. So far I have never taken it from any other species of the walnut⁹.

Thomasia salicicola Essig. A very dark species with a median dorsal longitudinal line on the backs of the apterous females

⁹ A common yellow species occurring on the leaves of various black walnuts in this region does not seem to agree with the descriptions of *Callipterus caryae* (Monell) or *Monellia caryella* (Fitch), however it has been determined as the latter by A. C. Baker.

occurring in very dense colonies on the terminal shoots of willows. Taken on the campus, June 13, 1916, infesting the arroyo willow, *Salix lasiolepis* Benth.

Pterocomma flocculosa (Weed) (figs. 14 and 15). Taken at



FIG. 15. *Pterocomma flocculosa* (Weed). Eggs laid on arroyo willow, *Salix lasiolepis* Benth., Sacramento, Cal., Dec. 14, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

Berkeley on arroyo willow, *Salix lasiolepis* Benth., June 15, 1916, at Rutherford, California, June 21, 1916, on the same willow, and at Sacramento, California, December 14, 1916, on the same plant. In the latter case the oviparous females were depositing quantities of eggs which were partially concealed by white

woolly material. This bark feeder is at once distinguished by the partial covering of thin white wool and the bright orange cornicles.

Pterocomma populifoliae (Fitch). This dark gray and brown species occurs plentifully on *Salix*, spp., on the campus, March 29, 1916. Lacks the cottony covering of the preceding species.

Tuberolachnus viminalis (Fonse.) (fig. 16). Our largest species occurring on willow and easily recognized by the gray color and the large black tubercle on the back between the cornicles. Abundant on the trunks and branches of various willows and feeding in large compact colonies. Taken on yellow willow, *Salix lasiandra* Benth., red willow, *S. laevigata* Bebb.,



FIG. 16. *Tuberolachnus viminalis* (Fonse.). Apterous viviparous females on longleaf willow, *Salix longifolia* Muhl. Berkeley, Cal., June 10, 1916. (Original.)

longleaf willow, *S. longifolia* Muhl., and arroyo willow, *S. lasiolepis* Benth., on the campus and at Berkeley and on the arroyo willow at Rutherford, California, June 21, 1916.

Lachnus pini-radiatae Davidson. This very dark green species is partially covered with a thin whitish woolly secretion and usually feeds in colonies in rows on the pine needles. Taken on the campus in small numbers on yellow pine, *Pinus ponderosa* Dougl., January 1 and March 11, 1915.

Lachnus tujafilinus Del Guercio. A robust brown and grayish species occurring in dense colonies on the twigs of common arbovitae, *Thuja occidentalis* Linn. Received from Chas. B. Weeks, Red Bluff, California, February 8, 1916.

Nectarosiphum rubicola (Oestlund). A large normally green species occurring in colonies on the undersides of the leaves of

the thimble berry, *Rubus parviflorus* Nutt., on the campus, March 29, 1916. At this date there were also a number of young pink forms not observed during the summer. The insects were especially abundant on the thimble berry in Wildcat Cañon near Berkeley, May 24, 1916. The species is easily recognized by the dusty tip of the primary wings.

Macrosiphum albifrons Essig. A large green species covered with a white pulverulence, which feeds upon various lupines, including *Lupinus latifolius* Agarth. and tree lupine, *L. arboreus* Sims., on the campus, March 29, 1916.

Macrosiphum californicum (Clarke) (syn. *M. laevigatae* Essig). A bright green, large very slender species infesting the terminal shoots of the young growth of various willows, especially the arroyo willow, *Salix lasiolepis* Benth., and the yellow willow, *S. lasiandra* Benth. Occurs on the campus throughout the summer and collected June 1, 13, and July 26, 1916. Also taken on the arroyo willow at Rutherford, California, June 21, 1916.

Macrosiphum granarium (Kirby). A large green and black aphid common on various grasses and taken as follows: oats, campus, March 10, 1916, and at Martinez, California, June 12, 1916; on meadow fox-tail, *Alopecurus pratensis* Linn., campus, April 25, 1916; on *Ampelodesma tenax* Link. and wild rye, *Elymus*, sp., campus, June 27, 1916. In case of the last two plants the flower heads were entirely covered with the insects.

Macrosiphum lactucae (Schrank). A large bright green and black species common on the tender terminal shoots of chicory, *Chicorium intybus* Linn., growing in an apparent wild state at Rutherford, California, June 21, 1916.

Macrosiphum ludoviciana (Oestlund). A large green species with the bodies of many covered with a thin white pulverulence. Collected on the campus March 10, 1916, and at Rutherford, California, June 21, 1916. In both cases the terminal tips of the common wormwood or California mugwort, *Artemisia heterophylla* Nutt., were infested.

Macrosiphum rhamni (Clarke). This large species is green with a noticeable large reddish, nearly circular blotch in the middle of the dorsum at the union of the thorax and abdomen. This coloration is internal and disappears with mounting. Apterous and winged forms were specially abundant on the leaves of coffee berry, *Rhamus californicus* Esch., and less common on cascara sagrada, *R. purshiana* DC., on the campus during

1916. Taken on the former, July 5, when it appeared to have reached its maximum development, and on the latter, June 29, 1916.

Macrosiphum rosae (Linn.). This is the common large green and reddish louse so common in the rose gardens of the state. Besides being found on all varieties of roses, this species has also been taken on the stems of the heads of the fuller's teasel, *Dipsacus fullonum* Linn., June 7, 1916, the red valerian or Jupiter's beard, *Centranthus ruber* DC., June 23, 1916, at Berkeley, California, and on wild rose, *Rosa californica* C. & S., at Rutherford, California, June 21, 1916.

Macrosiphum solanifolii (Ashmead). A large pale yellow or green aphid attacking a large number of plants. On the campus it was collected on yarrow, *Achillea millefolium* Linn., March 29, 1916, and on tobira or Japanese pittosporum, *Pittosporum tobira* Ait., July 5, 1916. Also taken on the tender shoots of the American, white or water elm, *Ulmus americanus* Linn., in Golden Gate Park, San Francisco, California, May 25, 1916.

Macrosiphum stanleyi Wilson. A beautiful large yellow and black species abundant on the undersides of the leaves of the red elderberry, *Sambucus racemosa callicarpa* Jepson, on the campus throughout the spring, summer and fall months. It was taken in fewer numbers on the tender growth of the blue elderberry, *S. glauca* Nutt., growing along the creek in shady places on the campus, May 15, 1916.

Idiopterus nephrolepidis Davis. A small pitch black species with whitish legs and black clouded areas in the wings. It is becoming of considerable economic importance as a pest to greenhouse and household ferns. During the past year it has been observed to be quite injurious to the common and improved Boston ferns, *Nephrolepis*, spp., as well as to the holly fern, *Cyrtomium falcatum* J. Smith.

Amphorophora latysiphon Davidson. A large green and black species with black conspicuously swollen cornicles. Large numbers of apterous and a single winged individual were taken on the crowns at and under the surface of the ground of Shasta daisies, *Chrysanthemum*, sp., Berkeley, California, August 15, 1916, and on the tender opening buds of the common garden cowslip, *Primula*, sp., December 17, 1916, at the same locality.

Amphorophora rubi (Kalt.). A large green aphid attacking the terminal shoots of the cultivated blackberry, *Rubus*, sp., and

wild blackberry, *R. vitifolius* C. & S., Berkeley, California, March 25, and June 6, 1916.

Toxoptera aurantiae Fonsc. A small black species attacking the leaves and terminal shoots of lemon, Martinez, California, June 12, 1916, and camellia, *Camellia japonica* Linn., in a lath-house at Oakland, California, July 25, 1916.



FIG. 17. *Phorodon humuli* (Schrank) on the underside of a plum leaf, Berkeley, Cal., April 10, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

Phorodon humuli (Schrank) (fig. 17). A pale yellowish green aphid which during the past season was first observed on the tender leaves of plum on the campus, April 7, 1916. At that time only apterous females occurred, but on April 14 a great many winged migrants were present and by April 25 practically all were winged. The species was also abundant on plum in Golden Gate Park, San Francisco, California, May 25, 1916. By the middle of the summer all had become winged and left the plum trees. Later in September specimens were taken on hops.

Rhopalosiphum arbuti Davidson. This is a fairly large green and black species occurring commonly on madrone, *Arbutus menzeisii* Pursh. on the campus. Other trees infested are: the strawberry tree *Arbutus unedo* Linn., campus, May 18, 1916; the tender tips of the mountain holly or Christmas berry, *Photinia arbutifolia* Lindl., campus, May 15, 1916. It was also collected on the strawberry tree in Golden Gate Park, San Francisco, California, June 5, 1916. E. P. Van Duzee of the California Academy of Sciences collected it on the common manzanita, *Arctostaphylos manzanita* Parry, at Hoberg's Resort, Lake County, California, August 2, 1916. This is undoubtedly *Rhopalosiphum nervatum* Gillette.

Rhopalosiphum howardii Wilson. A medium-sized, shiny dark red or almost black species associated with *Macrosiphum*

granarium (Kirby) on the leaves, stems and in the heads of oats at Martinez, California, June 12, 1916. It was later taken in the heads of barley at Rutherford, California, June 21, 1916. This is very close if not synonymous with *Rhopalosiphum rhois* Monell.

Rhopalosiphum lactucae (Kalt.). A normal-sized green and black aphid first taken by the writer on the common sow thistle, *Sonchus oleraceus* Linn., at Santa Paula, California, April 3, 1916, and erroneously labeled *Rhopalosiphum persicae* (Sulzer). Last year it was collected on the same host plant at Berkeley, California, June 28, 1916, and at San José, California, July 14, 1916.

Rhopalosiphum nervatum Gillette. A green species smaller than the common rose aphid, *Macrosiphum rosae* (Linn.), and distinguished from it by the darker wing veins and swollen cornicles. Occurs throughout the year and collected, February 20, 1916. (See *R. arbuti* Davidson).

Rhopalosiphum nymphaeae (Linn.) (fig. 18). A large dark-red plant louse covered with a fine white pulverulence or often a shiny dark green form as appears in the late summer. Winged and apterous viviparous females, all pink or dark-red, were first taken on tender twigs of a plum tree on the campus, April 7, 1916, where they occurred in large, compact colonies. The species, the same color phase, was also taken on plum in Golden Gate Park, San Francisco, California, May 25, 1916. By the middle of June none could be found on the plum in either locality, but on June 21, 1916, the dark green and shining phase was very abundant on water plantain, *Alisma plantago* Linn., and pondweed, *Potamogeton natans* Linn., at Rutherford, Cal.

Rhopalosiphum persicae (Sulzer). This is a very common green species with a conspicuous black patch in the middle of the abdomen of the winged form. It is an omnivorous feeder, attacking a very large number of plants. Among those observed during the past year were: *Lavatera assurgentiflora* Kellogg, campus, June 27, 1916; *Clarkia elegans* Dougl., campus, March 29, 1916; *Pentstemon spectabilis* Thurb., campus, March 29, 1916; California laurel or pepperwood, *Umbellularia californica* Nutt., campus, April 16, 1916; nasturtium, Hayward, California, April 19, 1916 (coll. by Roy E. Campbell); tulip tree, *Liriodendron tulipifera* (Linn.), campus, April 24, 1916; tobira or Japanese pittosporum, *Pittosporum tobira* Ait., campus, July 5, 1916;

tarata, *Pittosporum eugenioides* A. Cunn., campus, July 5, 1916; Victorian box, *Pittosporum undulatum* Vent., campus, July 5, 1916; *Baccharis douglasii* DC., Berkeley, California, June 17, 1916, red valerian or Jupiter's beard, *Centranthus ruber* DC.,



FIG. 18. *Rhopalosiphum nymphaeae* (Linn.). Colony on twig of plum. One mature apterous viviparous female and the remainder nymphs. Berkeley, Cal., April 18, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

Berkeley, California, June 23, 1916; the fullers' teasel, *Dipsacus fullonum* Linn., campus, June 27, 1916, *Escallonia pulverulenta* Pers., campus, June 27, 1916; *Melianthus major* Linn., campus, June 27, 1916, and sunflower, *Helianthus annuus* Linn., Berkeley, California, August 15, 1916.



FIG. 19. *Myzus cerasi* (Fab.) on the underside of a cherry leaf and curled leaves caused by the attacks. Berkeley, Cal., April 25, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

Rhopalosiphum rhois Monell. A dark green or black shiny aphid occurring abundantly on the tender shoots of the poison oak, *Rhus diversiloba* T. & G., during the spring and early summer, but entirely disappearing by the middle of summer. Often



FIG. 20. *Myzus varians* Davidson. Curled leaves of tender peach shoot caused by this insect. Berkeley, Cal., June 7, 1916.

causes severe curling of the leaves. Campus, July 3, 1916—only a very few were to be found at this date. (See *R. howardii* Wilson).

Myzus cerasi (Fab.) (fig. 19). A shiny black aphid with long cornicles, occurring in large dense colonies on the shoots and

young fruit of cherries and forming large curled pseudogalls on the former. Very common in this district and often the cause of much worry to orchardists. Collected at Berkeley, California, April 25 and August 21, 1916. Disappears soon after the last date.

Myzus circumflexum (Buckton). This is a very pretty yellow or pale green and black species which is a common greenhouse pest infesting maidenhair, asparagus and holly ferns and a great many other plants already listed by other writers. During the past year the species was taken on the tender shoots of the California laurel or pepperwood, *Umbellularia californica* Nutt., campus, April 16, 1916, on the flower heads of *Pentstemon spectabilis* Thurb., campus, March 29, 1916, and on the lower leaves of both of the show lilies, *Lilium elegans grandiflorum* and *L. speciosum rubrum* growing in a lath-house at Oakland, California, July 25, 1916.

Myzus fragaefolii Cockerell. A small pale yellow aphid infesting the undersides of the leaves of the cultivated strawberry and at times causing considerable smutting of the foliage. Taken at Niles, California, June 16, 1916.

Myzus varians Davidson (fig. 20). A pale yellow or green and black species somewhat resembling *Rhopalosiphum persicae* (Sulzer) which occurs in large colonies on the host plants and often causes much smutting of the foliage. Taken throughout the spring and summer on clematis, *Clematis brachiata* Thurb., on the campus and appear to reach their maximum development when collected, June 9th to the 29th, 1916. It was also taken July 7, 1916, at Berkeley infesting the terminal shoots of peach, causing the leaves to curl and become reddened much as if infected with peach curl. Within the pseudogalls thus formed were great numbers of the aphids; one or two trees were severely injured by the attacks.

Pentalonia nigronervosa Coquerel. A very interesting small black species greatly resembling *Idiopterus nephrolepidis* Davis. Specimens were received from Mr. E. M. Ehrhorn, who collected it on ferns at Honolulu, H. T., in March, 1916. This insect does not occur in California, but might be introduced or may have been, and could be easily mistaken for the other species which it resembles. It has previously only been reported on banana.

Hyalopterus arundinis (Fab.) (fig. 21). An average sized, pale green and black species with the bodies usually covered with

quite thick whitish pulverulence and occurring in dense colonies on the leaves of the young growth of prune and plum trees. It was also taken in considerable numbers on apricot trees at Niles, California, July 11, 1916. The Japanese varieties of plums appear to be immune to their attacks as was exemplified last year at Martinez, California, where a few prune trees growing in a thrifty young orchard of Burbank plums were very seriously attacked, while not a single infestation could be found on any of the plum trees. It is also of interest to know that the cracking, usually a cross, at the ends of prunes in the Santa Clara Valley



FIG. 21. *Hyalopterus arundinis* (Fab.) Prunes showing the characteristic splitting at the ends as a result of the presence of this insect on the foliage. Morgan Hill, Cal., July 14, 1916. (Original.)

has been definitely found to be due to the attacks of this insect, according to Horticultural Commissioner Earl Morris, and the annual loss occasioned is sometimes considerable.

Aphis albipes Oestlund (fig. 22). The apterous viviparous females are dark with whitish pulverulence arranged in definite patterns on the back as shown in the illustration. The apterous forms (fundatrix) were taken on the shoots of the snow berry, *Symphoricarpos racemosus* Michx., on the campus, March 25, 1916. Great numbers of both winged and apterous viviparous females were taken from the terminal shoots of the same plant on May 15, 1916. The leaves are often curled in dense irregular masses and form splendid protection for the insects. The species was determined by John J. Davis.

Aphis avenae Fab. A small dark green species abundant on corn, grain and grasses on the campus. Collected March, 1916.

Aphis bakeri Cowen. A small pale yellow or pinkish and black species taken sparingly on the flower heads and at the bases of the leaves of red clover, *Trifolium pratense* Linn.,



FIG. 22. *Aphis albipes* Oestlund. Apterous females on the leaf of snow berry, *Symphoricarpos racemosus* Michx. Campus, March 29, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

campus, June 29, and July 25, 1916. Not abundant here at any season.

Aphis brassicae Linn. (fig. 23). A pale green species covered with whitish pulverulence and feeding in compact colonies on the common cruciferous plants of the state. Especially injurious to cabbage, cauliflower, brussels sprouts, kale, mustard, radish, turnips, etc. Present throughout the year.

Aphis cardui Linn. (fig. 24). A fairly large green and black, shiny aphid. The apterous fundatrix occurred in small colonies on the tips of tender plum suckers on the campus, April 10, 15, 24, 25, 1916. It is very common throughout the summer in great colonies entirely covering all parts of the bull thistle, *Cirsium lanceolatum* Linn.

Aphis ceanothi Clark (syn. *A. ceanothi-hirsuti* Essig). A small dull reddish and black species which becomes very abundant



FIG. 23. *Aphis brassicae* Linn. A winter colony on the leaf of brussels sprouts. Berkeley, Cal., Nov. 6, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

on various species of *Ceanothus* throughout the state. Taken at Berkeley and on the campus infesting *Ceanothus thrysiflorus* Esch. and soapbush, *Noltea africana* Reichb., June 2, 1916. Also very common on soapbush in Golden Gate Park, San Francisco, California, May 25, 1916.

Aphis gossypii Glover. A small dark green or black aphid usually feeding in dense colonies. Abundant on the creek milkweed, *Asclepias speciosa* Torr., and a few on cascara sagrada, *Rhamnus purshiana* DC., on the campus, July 3 and 5, 1916. Also taken on show lily, *Lilium speciosum rubrum*, Oakland,

California, July 5, 1916; on woolly milkweed, *Asclepias vestita* H. & A., Visalia, California, July 19, 1916, by W. P. Baird, and on honeysuckle, *Lonicera*, sp., and catalpa, *Catalpa*, sp., at St. Helena, California, June 18, 1916, by C. W. Woodworth.

Aphis herderae Kalt.? A small dull black species occurring in compact colonies on English ivy, *Hedera helix* Linn., and a number of other plants is certainly not *Aphis rumicis* Linn., so is provisionally listed as this species. Abundant at Berkeley, California, and collected June 2, 1916.

Aphis helianthi Monell is a pale or dark green species with black markings on the winged form and occurs abundantly on the undersides of the leaves of the common and wild sunflower,



FIG. 24. *Aphis cardui* Linn. Apterous viviparous females taken from plum tree, Campus, April 10, 1916. (Original. Photo by Div. Sci. Illust., Univ. Calif.)

Helianthus annuus Linn. Unrecorded specimens first taken by the writer at Pomona, California, in 1909.

Aphis heraclei Cowen.¹⁰ A medium dark species with greenish or reddish mottlings on the dorsum. Occurs abundantly on the old yellow leaves of *Heracleum mantegazzianum* Sommier & Levier in the botanical garden on the campus, June 9, 1916.

Aphis malifoliae Fitch (syn. *Aphis sorbi* Kalt. for here). A common rosy and black species also slightly covered with a whitish pulverulence. Occurs on the young fruit and curls the leaves of apple. Often a serious orchard pest. Collected at Berkeley, California, April 28, 1916, by E. L. Prizer.

¹⁰ I am indebted to Mr. John J. Davis for the determination of this species and for the information that the specific name is also preoccupied by *Aphis heraclei* Koch, thus necessitating a new name for the above.

Aphis maidis Fitch. A small dark green aphid received from Bend, California, July 6, 1916, seriously infesting milo maize. The common species on corn throughout the state, however, is *Aphis avenae* Fab.

Aphis medicaginis Koch (fig. 25). The adults are shiny black with conspicuous whitish legs. Specimens were taken by the writer at Moorpark, California, August 11, 1911, where they were doing great damage to the foliage and pods of the blackeye bean,



FIG. 25. *Aphis medicaginis* Koch. Nymphs and adults on lemon leaf. Sacramento, Cal., 1913. (Original.)

Vigna catjang Walpers. It was also taken on the leaves of lemon, Capitol Park, Sacramento, California, July, 1913.

Aphis middletonii Thos. A pale green and pulverulent species first taken on the roots of rough pigweed, *Amaranthus retroflexus* Linn., and the roots of asters, Santa Paula, California, October 20, 1911.

Aphis nerii Fonse. A pretty dark yellow and black species common on the oleander during most of the year and also on milkweed during the summer. On the campus it attacks oleander and is specially abundant during the summer months on the

creek milkweed, *Asclepias speciosa* Torr. At Niles an oleander tree was seriously infested July 28, 1916. It was also taken on woolly milkweed, *A. vestita* H. & A., at Visalia, California, July 27, 1916, by W. P. Baird. This is without doubt the common milkweed species described by Montell as *Aphis lutescens* and occurs generally throughout the state.

Aphis oenotherae Oestlund. A small dark green, somewhat pulverulent species occurring in large numbers among the buds and on the flower heads of the evening primrose. Taken on *Oenothera biennis* Linn. on the campus, June 7, 1916, and on the common evening primrose, *O. grandiflora* Ait., and on *Epilobium adenocaulon occidentale* Trelease in Golden Gate Park, San Francisco, California, May 25, 1916.

Aphis persicae-niger Smith. A small shiny black species often abundant on the tender shoots of peach trees. During the past few years it has been received from a number of localities as follows: Peach, Berkeley, California, April 29, 1915; peach, Dinuba, California, April 30, 1915; peach, Yuba City, California, March 25, 1916 (H. P. Stabler); peach, Fresno, California, May 10, 1916; peach, Ventura, California, July 17, 1916 (S. H. Essig). In the latter case the infestation was severe and much of the fruit was also infested. This insect, though distributed throughout much of the state, has never become a serious orchard pest and only abundant on rare occasions.

Aphis pomi DeGeer. This small green and black aphid is a serious pest to a number of valuable ornamental trees in this section, notably the English hawthorn, *Crataegus oxyacantha* Linn. At Berkeley it has also been taken on the following: *Crataegus* spp., laurestinus, *Viburnum tinus* Linn., tarata, *Pittosporum eugenoides* A. Cunn., tawhiwhi, *P. tenuifolium* Gaertn., *Cotoneaster franchetii* Bois., apple and pear, as well as a number of other undetermined plants. The foliage is covered with honey-dew and soon collects dust or becomes covered with the black smut fungus so as to assume a most undesirable appearance.

Aphis rumicis Linn. A dull black species occurring in dense colonies and generally confused with another species which I am calling *Aphis hederæ* Kalt. What, according to Davis, is true *A. rumicis* has been taken at Berkeley, California, on the Western dock, *Rumex occidentalis* Wats, April 13, 1916, and on other species of *Rumex* and on the common garden poppy, *Papaver*, sp., June 15, 1916.

Aphis salicicola (Thomas). A pale green species with bright orange-colored males. Very abundant on the tender tips of the arroyo willow, *Salix lasiolepis* Benth., Rutherford, California, June 21, 1916. The species occurred on the same plant throughout the summer and fall at Berkeley and on September 20, 1916, the sexual males and females were also abundant and mating freely.

Aphis sambucifoliae Fitch. The winged and apterous viviparous females are dull black while the sexuparae are amber or dull brownish. The former occur throughout the summer on the blue elderberry, *Sambucus glauca* Nutt. The sexuparae were taken in few numbers on the leaves of the red elderberry, *S. racemosa callicarpa* Jepson, on the campus, September 21, 1916.

Myzaphis abietina (Walker). A very small dark green aphid common on the smaller branches of the Norway spruce, *Picea excelsa* Link, in Golden Gate Park, San Francisco, California, May 25, 1916.

Myzaphis rosarum (Kalt.). A small dark green species often very abundant on the leaves of roses and usually the most serious rose pest, causing severe smutting of the foliage. Taken at Berkeley, California, June 16, 1916, and throughout the summer and fall.

Siphocoryne capreae (Fab.). The apterous forms are pale green and the winged forms pale green and black. Common here on willows, including the arroyo willow, *Salix lasiolepis* Benth., campus, June 13, 1916. Also abundant on the wild or sweet anise, *Carum kelloggii* Gray, at St. Helena, California, June 18, 1916 (C. W. Woodworth) and at Berkeley, California, June 20, 1916. It is the commonest aphid attacking the latter.

Siphocoryne xylostei Schrank. A dull green species often with thin coating of whitish pulverulence. Common on the tender shoots of the honeysuckle, *Lonicera*, spp. Taken at Berkeley, California, July 20, 1916, by Miss A. Williamson.

Liosomaphis berberidis (Kalt.) A small yellow or pale green aphid often very abundant on various species of the barberry and causing considerable smutting. Taken on *Berberis vulgaris* Linn., Golden Gate Park, San Francisco, California, June 5, 1916; on *Berberis*, sp., campus, June 7, 1916, and on *B. vulgaris* Linn., Niles, California, September 30, 1916.

Cerataphis lataniae (Boisduval) (fig. 26). This is a very interesting plant louse and more often taken for a scale insect or

the immature form of a white fly than for an aphid. The young apterous viviparous females are dark or pale brown and when mature acquire a white fringe around the margin as shown in the illustration (fig. 26). The winged forms are dull brownish or blackish in color. The species occurs in greenhouses through-

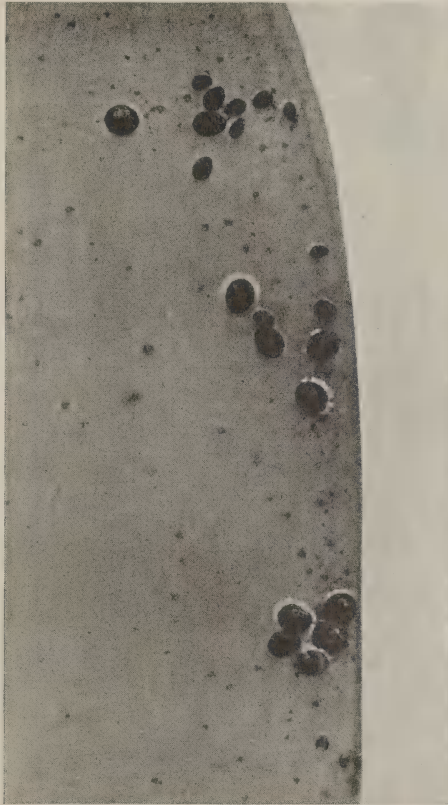


FIG. 26. *Cerataphis lataniae* (Boisduval). Apterous viviparous females on leaf of orchid. Oakland, Cal., July 25, 1916. (Original.)

out this district and sometimes becomes a pest to orchids. Taken on orchids, Oakland, California, July 25, 1916.

Pemphigus populitransversus Riley (figs. 27 and 28). The fundatrix is pale amber or yellowish with tufts of white cottony material arranged in rows on the dorsum. The virgogeniae are black with more or less cottony material at the posterior end of



FIG. 27. *Pemphigus populitransversus* Riley. Galls formed on the leaf petioles of poplar. Berkeley, Cal., Aug. 17, 1916. (Original.)



FIG. 28. *Pemphigus populitransversus* Riley. Stem-mother or fundatrix, and virgogeniae. Campus, Aug. 17, 1916. (Original.)

the abdomen. Forms large galls on the leaf petioles, near the leaves, of poplar. Campus, August 15, 1916.

Eriosoma, sp.? (fig. 29). An undetermined species designated by the common term Wilson's bonnet gall-louse, by Patch.



FIG. 29. *Eriosoma*, sp. Large pseudogall produced on the leaf of English elm, *Ulmus campestris* Smith. Berkeley, Cal., July 8, 1916. (Original.)

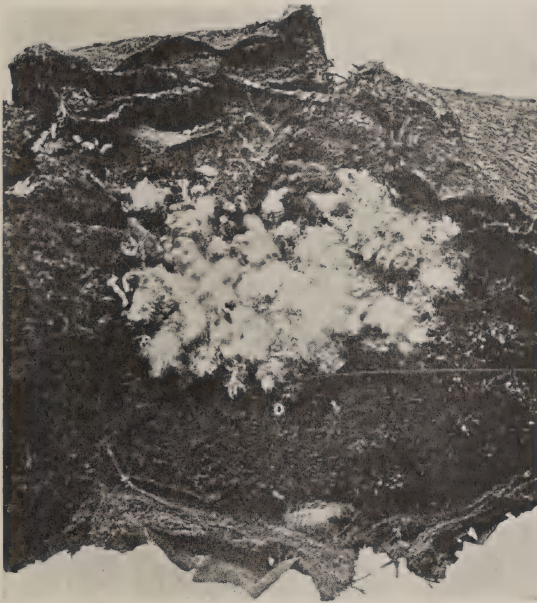


FIG. 30. *Eriosoma lanigera* (Hausm.) Colony of the woolly apple aphids on apple. (Author's illust., Ben. & Inj. Ins. Cal.)

The winged forms are dark and often very numerous in large pseudogalls on the leaves of the English elm, *Ulmus campestris* Smith, at Berkeley, California, July 8, and Hayward, California, July 14, 1916.

Eriosoma lanigera (Hausm.) (fig. 30). A dull reddish species with the bodies entirely covered with long white woolly material giving rise to the common name woolly aphis. A very common species throughout the state on apple and rarely on pears. Sexuparae begin to appear the last of September on the campus, but so far I have not succeeded in taking the sexuales.

Chermes cooleyi Gillette. A very small pinkish or dark, nearly globular plant louse occurring on the needles of various conifers and usually covered with white cottony material and appearing as small white specks on the trees. Sometimes very abundant and injurious. Taken on the campus on Monterey pine and other conifers, March 29, 1916.

Transmitted January 8, 1917.

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Vol. 1, No. 8, pp. 347-367

March 28, 1918

NEW GENERA AND SPECIES OF ENCYR-
TINAE FROM CALIFORNIA PARASITIC
IN MEALYBUGS (HYMENOPTERA)

BY

P. H. TIMBERLAKE

UNIVERSITY OF CALIFORNIA PRESS
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ENTOMOLOGY

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March 28, 1918

NEW GENERA AND SPECIES OF ENCYRTINAE FROM CALIFORNIA PARASITIC IN MEALYBUGS (HYMENOPTERA)

BY

P. H. TIMBERLAKE

Hawaiian Sugar Planters' Experiment Station

The material which forms the basis of this paper has been assembled during the last three or four years, mainly through the efforts of Mr. C. P. Clausen while engaged in a study of *Pseudococcus* and related genera in California. In all, three new genera and six new species are described, the types of which will be deposited ultimately in the United States National Museum. Notes on two foreign or introduced species under *Tanaomastix* are included to complete the generic conception.

Tribe MIRINI

Acerophagus¹ Emily Smith

Of the three species included in the material two are new and all belong to the *A. texanus* group, the five species of which now known may be separated as follows:

FEMALES

1. Wings without a conspicuous cross band 2
Wings with a smoky band across the disk**A. fasciipennis**, n. sp.
2. Frontoververtex about one-third to three-fourths longer than wide 3
Frontoververtex about twice as long as wide, the ocelli in an angle of about 85°**A. notativentris** (Girault)

¹ For a recent revision of this genus see Proc. U. S. Nat. Mus., vol. 50, pp. 574-79. The antennal club of *A. texanus* (Howard), represented as solid in figure 52, plate 31 (*loc. cit.*), in reality is composed of three closely fused joints except in the male.

3. Ocelli small, the posterior pair their own diameter from eye-margin, coloration pale 4
 Ocelli large, the posterior pair close to eye-margin, coloration vivid orange yellow*A. texanus* (Howard)
4. Frontoververtex about three-fourths longer than wide, the ocelli in a right angle, coloration chrome lemon yellow*A. pallidus*, n. sp.
 Frontoververtex wider, about one-half longer than wide, the ocelli in slightly more than a right angle, coloration pale cadmium yellow*A. gutierreziae* Timberlake

MALES

1. Wings hyaline throughout 2
 Wings with a smoky band across the disk*A. fasciipennis*, n. sp.
2. Coloration pale yellow, the abdomen usually more vivid than thorax 3
 Coloration orange yellow, the abdomen concolorous*A. texanus* (Howard)
3. Abdomen without a dark blotch behind the vibrissae 4
 Abdomen with a conspicuous blackish brown blotch behind the vibrissae*A. notativentris* (Girault)
4. Thorax and abdomen pale cadmium yellow.....*A. gutierreziae* Timberlake
 Thorax gamboge yellow, the abdomen more orange yellow especially at apex and with two dusky transverse bands across the middle*A. pallidus*, n. sp.

***Acerophagus fasciipennis*, n. sp.**

FEMALE

Frontoververtex about one-half longer than wide; the ocelli in a right-angled triangle, the median one situated considerably nearer the occipital margin than in *A. gutierreziae*, or very noticeably behind the center of the frontoververtex, the posterior pair less than their own diameter from the eye-margin and about twice as far removed from the occipital margin; eyes not pubescent; antennae practically as in the other species of the group, except that the scape and club are proportionately considerably shorter (see table of measurements below); wings nearly uniformly ciliated, the speculum² extremely narrow above or practically obliterated, abruptly widening below and connecting with a branch of the hairless streak on the posterior margin; ovipositor slightly longer than in *A. gutierreziae*, or about two-fifths the length of abdomen, its sheaths pubescent. Length, exclusive of ovipositor, 0.75 mm.

Coloration a little paler than in *A. gutierreziae* or more of a clay yellow, the underparts still paler, but the abdomen decidedly brighter or more orange yellow; appendages concolorous with

² The term adopted here is one used by Thomson for the oblique hairless streak.

underparts, the antennae except club, however, a little deeper yellow than legs; the ovipositor black at apex; wings with a conspicuous tegumentary smoky band across the disk, its distal margin opposite the end of the stigmal vein and slightly convex, the basal fourth of wing with a brown dot on lower margin at the very base; hind wings also slightly smoky across the middle.

MALE

Frontovertex about one-third longer than wide, the anterior ocellus at the center; otherwise structurally about as in female. The coloration slightly paler, more of a chrome lemon yellow, the abdomen orange yellow, and the wings banded as in the female. Length, 0.8 mm.

Described from one female, one male (type and allotype) reared from early larval stages of *Pseudococcus crawii* (Coquillett), Uplands, California, November, 1914 (C. P. Clausen), Clausen no. 53.

***Acerophagus notativentris* (Girault)**

Fig. 1

Pseudaphycus notativentris Girault, Descrip. Hym. Chalcid. variorum cum Observ., vol. 3, p. 10, Glendale, Md., May, 1917.

FEMALE

Frontovertex nearly twice as long as wide, finely granulose about as in *A. texanus* and minutely punctulate; ocelli forming an angle of about 85° , the anterior one a little behind the center

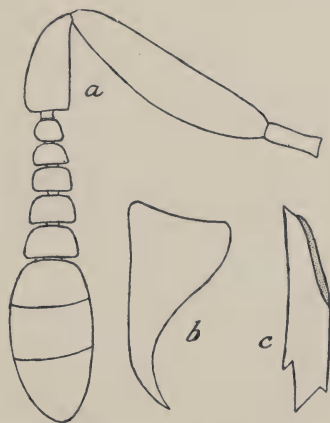


Fig. 1. *Acerophagus notativentris*: A, antenna of female; B, right mandible of female, exterio-dorsal view; C, same, anterior view.

of the frontovertex, the posterior pair about their own diameter from the occipital margin and less than half as far from the eye-margin; face considerably shorter than length of eyes, the scrobes as in the other species; eyes with a rather thick, but fine, short pubescence; funicle joints of antennae (fig. 1, A) proportionately a little wider for their length than in other species; dorsal tooth of mandible (fig. 1, B and C) much smaller and more basal than usually; wings uniformly ciliated, the speculum narrow, not interrupted and reaching nearly to the posterior margin; ovipositor protruded about one-fourth the length of abdomen, its sheaths pubescent. Length, 0.5–0.8 mm., exclusive of ovipositor.

Coloration about cadmium yellow, the face, cheeks, and underparts a little paler; a transverse spot on concealed part of pronotum blackish; the metanotum, but not propodeum, slightly brownish; a spot on sides of abdomen before the vibrissal plates, the vibrissal plates and the margin of the segments in the center of the dorsum of abdomen brown; antennae dusky yellowish, the scape somewhat purer yellow, the club more whitish; coxae and femora yellowish white, the tibiae and tarsi more yellowish with apex of last tarsal joint dusky; exerted portion of ovipositor dusky; wings hyaline, the veins pale yellowish; pubescence of head and thorax dusky.

MALE

Similar to the female in all characters; the frontovertex a trifle wider, the ocelli more nearly in a right angle; the abdomen a little shorter than thorax instead of as long. Coloration somewhat brighter or more of a chrome lemon yellow, the face and underparts more vivid, and the dorsum of abdomen behind the vibrissal plates blackish brown except the sides. Length, 0.42–0.6 mm.

Redescribed from thirteen females, nine males, reared October, 1914, and during the summer of 1915, from a *Pseudococcus* species on grape, Fresno, California (H. S. Smith), California State Insectary no. 675, also compared with Girault's types.

***Acerophagus pallidus*, n. sp.**

Fig. 2

FEMALE

Frontovertex about three-fourths longer than wide, about as closely granulose as in *A. texanus* or almost punctulate; ocelli in a right-angled triangle, the anterior one noticeably behind the

center of the frontovertex, the posterior pair nearly their own diameter from eye-margin and twice as far removed from occipital margin; face a little shorter than length of eyes, the head being a little thinner anteroposteriorly than in *texanus* or *gutierreziae*, the scrobes about the same; eyes with a very fine, short, sparse pubescence; antennae (fig. 2, A) about as in other species of the *texanus* group, the pedicel, however, proportionately longer and slenderer, or a little longer than the first four funicle joints combined; mandibles (fig. 2, B and C) normal; wings uniformly ciliated, the speculum somewhat wider below and nearly connecting with the hairless streak on the posterior margin; ovipositor about one-third the length of abdomen, its sheaths pubescent. Length, 0.9 mm., exclusive of ovipositor.

Coloration almost uniformly pale yellow, about chrome lemon, the appendages concolorous, with apex of ovipositor black; wings hyaline, the veins pale yellowish; pubescence on head and body about as abundant as in the other species of the group, but not conspicuous except on face, where it is whitish or silvery.

MALE

Similar to the female, but the following differences may be noted: Frontovertex slightly wider or about one-half longer than wide, the ocelli in a slightly acute or almost equilateral triangle. Coloration the same, except that the dorsum of the abdomen at apex is orange yellow, separated from the paler base by a narrow, transversely arcuate dusky band between the vibrissae. Length, 0.7 mm.

Described from two females, two males (type, allotype and paratypes *a* and *b*) reared from *Pseudococcus yerbasantae* Essig, May 12, 1915, Sespe Cañon, California (C. P. Clausen), Clausen no. 67.

TABLE OF FEMALE ANTENNAL MEASUREMENTS (LENGTH × WIDTH) OF
ACEROPHAGUS IN MICRONS

	Scape excluding radicle	Pedicel	Funicle 1	Funicle 2	Funicle 3	Funicle 4	Funicle 5	Club
<i>A. fasciipennis</i>	141×30	60×20	15×16	12×19	12×20	16×23	20×28	105×38
<i>A. pallidus</i>	180×36	82×25	18×18	18×20	18×20	18×25	24×30	129×54
<i>A. gutierreziae</i>	154×23	59×25	12×15	12×18	15×20	.....	.....	.....
<i>A. notativentris</i>	157×38	67×30	12×20	12×23	15×28	20×33	23×38	136×61
<i>A. texanus</i>	159×36	64×28	15×23	18×25	20×28	20×31	20×38	136×59

Stemmatosteres,³ n. gen.

FEMALE

Head very thin anteroposteriorly, a little wider than thorax, the greater portion of frontovertex and face lying in one plane, which is very slightly convex; seen from in front, the outline is rounded, the occipital margin appearing truncate, the length and width about equal; in lateral view (fig. 3, B) the outline is narrowly and irregularly oval, the greatest thickness just below the eyes; in dorsal view (with head held vertically) only the vertex visible, sloping gently backward to the occipital margin, which is abruptly rounded, not sharp, its outline now appearing concave; occiput with a rather shallow, semicircular excavation on the dorsal half into which the prothorax fits, the neck being

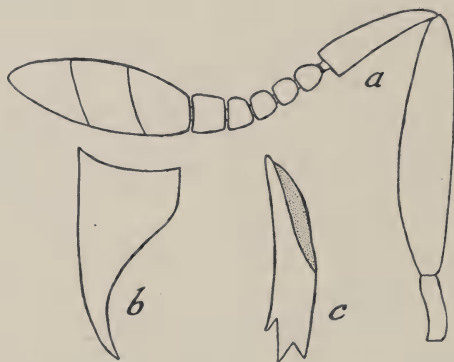


Fig. 2. *Acerophagus pallidus*: A, antenna of female; B, right mandible of male, exterio-dorsal view; C, same, anterior view.

inserted near the dorsal margin of the excavation, so that the head may be held either vertically or horizontally, the former position apparently being the normal or resting position in life; frontovertex considerably wider than long, the ocelli absent, the eyes small, oval, coarsely faceted; face abruptly rounded off to the oral margin from just above the antennal sockets, the scrobes entirely absent; cheeks a little longer than length of the eyes; antennae (fig. 3, C) inserted rather far apart and close to the

³ From στεμματοστερής, deprived of stemmata, in reference to the lack of ocelli.

oral margin, a little less than half as long as body, distinctly clavate; the scape slender, compressed; pedicel as long as the first three funicle joints; the funicle five-jointed, all joints short, increasingly transverse, the fifth nearly twice as wide as long; club large, oval, not much wider than the last funicle joint and as long as funicle and pedicel combined, composed of two joints, the basal one being much shorter; mandibles (fig. 3, E) with three long, acute teeth, the ventral one far more basal, the upper two at the apex, with the middle one slightly longer. Thorax small, the visible portion of dorsum hardly more than one-half as long as abdomen; pronotum very large, fully as long as the mesoscutum and scutellum combined; mesoscutum very short and transverse, about four times wider than long; scutellum also short and transverse, a little longer than the scutum, the axillae coalesced with it, the sutures not at all visible unless insect is mounted in balsam; metathorax and propodeum concealed by the base of the abdomen, which overlaps the posterior part of the thorax so that the apex of the first abdominal segment and the posterior margin of the mesopleura lie in the same vertical plane; wings either absent or vestigial, the front pair visible in some specimens as minute, linear scales, no longer than the scutellum, bearing two bristles at apex and one on the side, hind pair of wings apparently entirely absent; legs short, normal, the middle tibial spur slender, tapering, a little shorter than the first tarsal joint, hind tibiae with two spurs, the smaller one half as long as the other. Abdomen large, oval, depressed, the first segment shortest, the second longest; ovipositor shortly protruded, otherwise enclosed by the fifth sternite, which reaches to the apex of the abdomen but does not become at all compressed; vibrissal plates situated at the apical fourth, the vibrissae reaching about to the apex. Surface of head and body nearly smooth, or very finely alutaceous, the frontovertex with extremely minute, shallow, scattered setiferous punctures; pubescence short, very delicate, pale colored, and hardly visible except under high magnification; coloration yellow, non-metallic, but with a pearly luster.

MALE

Much like the female, except that the abdomen is considerably shorter and wider, the antennal scape (fig. 3, D) a little wider and the club considerably longer and solid.

TYPE OF GENUS

Stemmatosteres apterus, n. sp.

This genus is anomalous in the absence of ocelli, in the structure of the antennal club, the reduction and peculiar configuration of the thoracic sclerites and the overlapping of the abdomen upon the posterior part of the thorax. The wings are probably never fully developed on account of the reduction of the mesonotum. The genus appears to be most closely allied to *Acerophagus* Smith.

Stemmatosteres apterus, n. sp.

Fig. 3

FEMALE

Head and body chrome lemon yellow, the dorsal surface of the head with a pearly luster (in life) which reappears to a less degree on other parts of the body; antennae dusky yellowish, purer yellow at the base of the scape; legs concolorous with body, dusky only at tip of the last joint of the tarsi; a linear mark on each side of pronotum at the neck, and the exerted portion of the ovipositor sheaths blackish; the vibrissal plates brown.

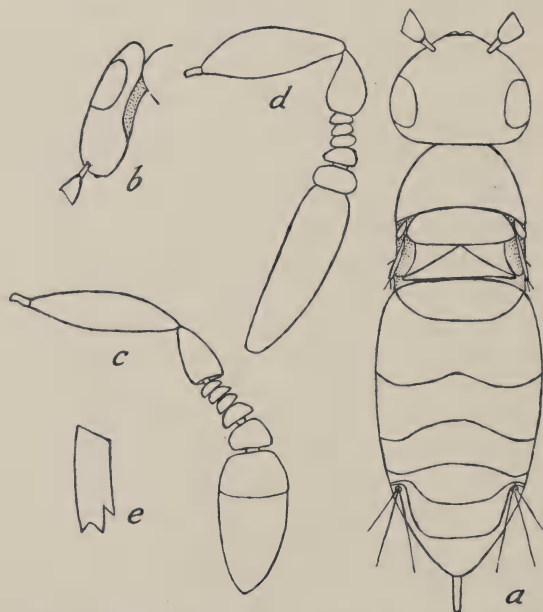


Fig. 3. *Stemmatosteres apterus*: A, female, dorsal view; B, lateral view of head, female; C, antenna of female; D, antenna of male; E, right mandible of female, ventral view.

Length, 0.5–0.6 mm. with head held vertically, 0.6–0.7 mm. with head extended horizontally, exclusive of ovipositor.

MALE

Colored like the female, except that the yellow is decidedly more of a chrome orange tint especially on the abdomen. Length, 0.4–0.46 mm. with the head vertical, 0.49–0.55 mm. with head horizontal.

Described from eight females, two males (type, allotype and paratypes *a* to *h*) reared from *Pseudococcus timberlakei* Cockerell, November 1–3, 1915, Millbrae (in salt marsh), California (P. H. Timberlake), Salt Lake Laboratory no. 1830 A.

***Pseudococcobius* Timberlake**

This genus recently characterized (Proc. U. S. Nat. Mus., vol. 50, p. 563, May, 1916) appears on further study of the genotype and the additional species described below much more closely allied to *Aphycus* than was at first supposed, and the discovery of a few more species might well bridge the relatively slight gap between the two groups. The species belonging here are probably all parasitic in mealybugs, and the differences separating them from *Aphycus* appear to be an adaptation to their soft-bodied hosts. The abdominal character used in my recent paper on *Aphycus* to separate the two groups proves to be unreliable, as I have discovered since that the fifth sternite often reaches to the apex of the abdomen even in *Aphycus*, although there is no marked tendency towards compression of the abdomen as seen in *Pseudococcobius*. The mandibles, however, so far as they have been studied carefully, always have acute teeth in *Pseudococcobius* and blunt teeth in *Aphycus*, but otherwise do not differ much. The antennal club of *P. terryi* is not actually solid, as stated in my paper, but composed of three closely fused joints, as a study of fresh material proves, although it seems nearly if not quite impossible to distinguish them under ordinary circumstances.

Aphycus oracae Howard belongs in the *Pseudococcobius* group, as a reëxamination of the type discloses the fact that the mandibular teeth are acute. This species is similar to *P. fumipennis*, described below, in type of coloration but is quite distinct.

Pseudococcobius ehrhorni is not congeneric with *terryi*, as the mandibles are distinctly bidentate and considerably more narrowed toward the apex. The antennae also are considerably

different. It is one of the apparently rather numerous forms that make a gradual transition between the more typical members of the Ectromatini and Mirini. The accession of fresh material of *chrhorni* permits a better understanding of its structural peculiarities, and it is consequently elevated to generic rank.

***Pseudococcobius fumipennis*, n. sp.**

Fig. 4

FEMALE

Head as seen from in front hardly wider than long, not so thick anteroposteriorly as in *P. terryi*; frontovertex about one-half longer than wide; ocelli in an equilateral triangle, the posterior pair about one-fourth their own diameter from the eye-margin, the median one at the center of the frontovertex; eyes large, not pubescent, in outline nearly circular except for the dorsal orbits being parallel; cheeks moderately long, or about four-fifths as long as the diameter of the eyes; antennal scrobes moderately deep, meeting above in an acute angle; mandibles (fig. 4, B and C) with the teeth acute and nearly equal. An-

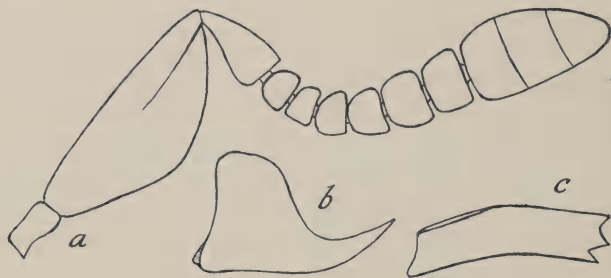


Fig. 4. *Pseudococcobius fumipennis*: A, antenna of female; B, right mandible of male, exterio-dorsal view; C, same, anterior view.

tennal scape (fig. 4, A) flattened and expanded below, nearly one-half as wide as long; pedicel about as long as the first three funicle joints combined; the funicle increasing gradually in width so that the sixth joint is a trifle more than one-half wider than the first, the first three, and especially the second, shorter than the last three joints, all increasingly wider than long; club large, oval, rounded at apex, a little longer than the last three funicle joints combined, and after collapsing one-third as wide again as the last funicle joint. Wings thickly ciliated, the cilia

a little weaker at apex; speculum narrow, reaching two-thirds of the distance to the posterior border of wings and well separated from a cut-off portion which is equally distant from the posterior wing-margin; bristles on the submarginal vein a little more developed than in *terryi*, but still weak. Length, 0.9-1.2 mm.

Lower part of face and cheeks, almost the entire upperparts of the body, and the venter of abdomen dull black, the latter with a small white spot on each side near margin at the base; frontovertex very pale ochraceous brown, narrowly margined on all four sides and narrowly striped down the middle or at least in the ocellar region with brownish black; upper portion of face and cheeks creamy white to flesh tinted, the pale area on face divided into two transverse bands by a blackish band of about the same width which stretches between the lower corners of the eyes; on the cheeks the pale area barely touches the lower corners of the eyes and is separated from the eye-margin posteriorly by a triangular blackish area continued forward as a narrow line and cutting across the lower corners of the eyes to unite with the black facial band; occiput pale ochraceous brown; collar of pronotum narrowly whitish with a blackish dot on each corner; tegulae pale brownish at the center and on the posterior margin, whitish on the anterior and lateral margins; underparts of thorax dull brownish black with the anterior corners of the mesopleura, and the prepectal plates whitish. Antennae brownish black, with an oval spot on dorsal, apical corner of scape, and the apical half of pedicel, with the last two funicle joints white, the club slightly paler at apex. Legs dull brownish black variegated with white as follows: apical portion of all coxae, the trochanters, the dorsal margin of front femora with apex and a small spot on ventral margin near apex; base and apex of middle and hind femora and a narrow band near apex of each, on the middle pair connecting on lower margin with the apical area; base of all tibiae and two narrow cross bands on each, less distinct on front pair; all the tarsi except last joint on front and middle pair and last two joints on hind pair, and the tibial spur white. Fore wings conspicuously smoky, due to integumentary pigmentation, gradually becoming clearer toward the apex and the base, with a small clear spot at the apex of the submarginal vein and a more deeply stained area at the juncture of the marginal and stigmal veins; hind wings hyaline.

MALE

Entirely similar to the female in structural and colorational characters, except that the last two funicle joints are brownish instead of white. Length, 1.2 mm.

Described from two females and two males (type, allotype, and paratypes *a* and *b*) reared from *Pseudococcus solani* (Cockerell), Uplands, California, June, 1914 (C. P. Clausen), Clausen no. 23.

***Pseudococcobius clauseni*, n. sp.**

Fig. 5

MALE

Head rather thin anteroposteriorly, as seen from in front about one-fifth wider than long; frontovertex about twice as long as wide, the dorsal orbits of eyes parallel; ocelli in an acute-angled triangle, the posterior pair about one-half their own diameter from the eye-margin, and twice their own diameter from the occipital margin; eyes large, about one-fifth longer

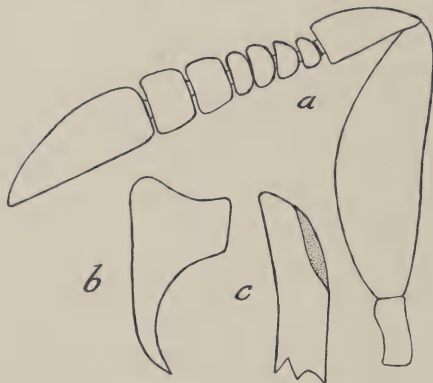


Fig. 5. *Pseudococcobius clauseni*: A, antenna of male; B, right mandible of male, exterio-dorsal view; C, same, anterior view.

than wide, thinly pubescent with short pile; cheeks as long as the width of the eyes; face with a moderately developed prominence between the antennae, the scrobes rather shallow, narrow and meeting above; mandibles (fig. 5, B and C) rather wide at apex with three sharp, nearly equal teeth, which are longer than in *P. fumipennis*. Antennal scape (fig. 5, A) flattened, moderately expanded below, about one-third as wide as

long; pedicel a little longer than the first four funicle joints combined; funicle increasing in width distad so that the sixth joint is over one-half wider than the first; the first four joints short, the first two a trifle longer than the third and fourth, each except the first about twice as wide as long, the last two joints nearly twice as long as the preceding, yet still wider than long; club solid, no wider than the funicle, a little longer than the preceding five joints combined, and obliquely rounded at the apex dorsoventrad; first five funicle joints with comparatively long and coarse pile, the sixth joint and club with a much thicker, finer and shorter pubescence. Wings with a narrow, curved cross band of weaker, paler cilia at the end of the stigmal vein; speculum very narrow but uniform, not quite reaching the stigmal vein nor more than two-thirds of the distance to the posterior margin; bristles on submarginal vein well developed. Abdomen about two-thirds as long as the thorax, triangular in outline, depressed, the base cordate. Length, 0.8 mm.

The frontovertex and upperpart of face to lower margin of eyes pale clay yellow, more cadmium yellow next to the orbits and dusky or brownish on vertex behind the ocelli; occiput, cheeks and lower part of face blackish brown, a paler brown, transverse spot above antenna; thorax and abdomen dull black with a slight brownish tint; the pleura more brownish, with most of the propleura, the prepectal plates and the anterior margin of the mesopleura dusky whitish; collar of pronotum whitish with a brown dot on each corner; tegulae blackish brown with anterior and exterior margin whitish. Antenna black, with the sixth funicle joint and the club white. Anterior legs pale brownish with most of the trochanter, the basal, inner, ventral margin and band close to the apex of the femora, the base and apex of tibiae and the tarsi yellowish white, the first and last two tarsal joints, however, dusky; middle trochanters and femora dusky white with a brownish streak on the under side of the latter, the tibiae whitish with base and apex narrowly blackish and with two brownish black annuli near their middle, the tarsi and tibial spur dusky yellowish, the last tarsal joint darker; hind legs similar to the front pair except that the tibiae have an additional, narrow white annulus at their middle, and the femora have their upper, inner margin whitish. Basal half of wings deeply smoky to the end of the stigmal view, with the apical margin of the area convex, and separated by a rather narrow, curved pale band from the slightly dusky apex of the

disk, the basal area being integumentarily stained although strengthened by the dense, dark colored ciliation, the apical dusky area, however, entirely ciliary in origin. Pubescence of head and body whitish and conspicuous on the dark parts.

Described from one male reared from an *Erium* species on cactus, Riverside, California, October, 1914 (C. P. Clausen), Clausen no. 10.

Cirrhencyrtus,⁴ n. gen.

FEMALE

Head moderately thick anteroposteriorly, the dorsal surface convex, passing over into face by a rather abrupt curve, the frontovertex moderately wide, the ocelli in a right-angled triangle, the posterior pair close to the eye-margin and much farther removed from the occipital border; seen from in front, the head is about as wide as long, the cheeks a little longer than width of eyes and converging toward the broadly truncated oral margin; seen from the side, the head is subtriangular in outline; occiput uniformly but not deeply concave, the neck inserted at the center;

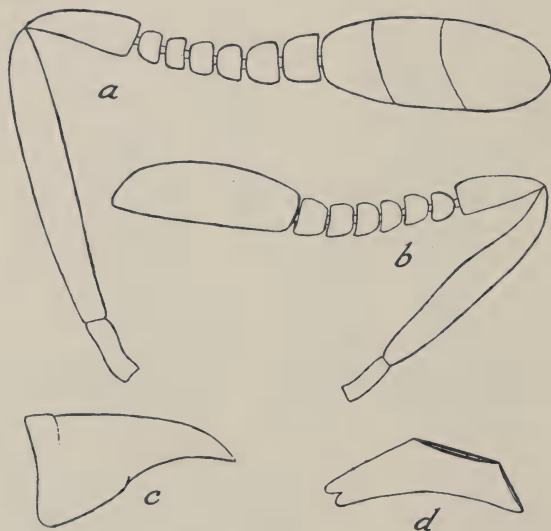


Fig. 6. *Cirrhencyrtus ehrhorni*: A, antenna of female; B, antenna of male; C, left mandible of female, exterior-dorsal view; D, same, anterior view.

⁴ From *Kip'ós*, tawny yellow, and *Encyrtus*.

eyes moderate in size, oval, one-third longer than wide, slightly pubescent; mandibles (fig. 6, C and D) narrowed toward apex with two nearly equal, blunt or rounded teeth, of which the dorsal is more apical; antennal scape (fig. 6, A) cylindrical, moderately long, reaching considerably beyond plane of front, pedicel as long as the first four funicle joints; funicle six-jointed, increasing slightly in width distad, all joints short, transverse; club large, oval, somewhat longer than the funicle, in life hardly wider than funicle, but after death collapsing so that it is much wider, its sutures plainly visible, the last joint longest with a rounded area of softer tissue at its apex. Thorax of normal structure, the pronotum arched, the mesoscutum transverse, the axillae meeting medially, the scutellum flat, triangular with apex slightly rounded, its sides abruptly declivous; wings large, uniformly ciliated, with oblique hairless streak or speculum; marginal vein punctiform, stigmal moderately long, its apex triangularly enlarged, postmarginal nearly as long as the stigmal, but rapidly tapering and becoming transparent, bristles on submarginal vein reduced; costal cell of hind wing narrowed distad but extending to the hooklets; legs longer and slenderer than normally, especially the middle pair, the middle tibial spur moderately long and slender, shorter than the first tarsal joint. Abdomen rather subquadrate in shape, its sides nearly parallel, the apex subtruncate; excluding the ovipositor, which is slender and prominently protruded, its length is about equal to two-thirds of the thorax; the venter not at all compressed, the fifth sternite reaching to the apex. Sculpture alutaceous, the frontovertex more coarsely so; vestiture moderately abundant, dark colored on the thorax; coloration flavous, the collar of pronotum, tegulae and appendages concolorous.

MALE

Very similar to the female, but the frontovertex is wider, the ocelli larger, the antennae (fig. 6, B) a little shorter with slightly longer, thicker pubescence, the club solid and slenderer, the postmarginal vein considerably shorter, and the abdomen more ovate.

TYPE OF GENUS

Pseudococcobius ehrhorni Timberlake**Cirrhencyrtus ehrhorni** (Timberlake)

Pseudococcobius ehrhorni Timberlake, Proc. U. S. Nat. Mus., vol. 50, p. 564, 1916.

Fig. 6

The male hitherto unknown differs from the female as follows: Frontoververtex about one-fourth longer than wide; antennae a little smaller, more pubescent, the club obliquely acuminate on the upper side. Coloration the same, except that the black dots on venter at apex are absent, the metapostnotum and the abdomen above at center blackish brown, and the antennae pale brownish with base of scape alone yellowish. Length, 1.1 mm.

One male and female reared from *Pseudococcus ryani* (Coquillett) Berkeley, California, August 20, 1914 (C. P. Clausen), Clausen no. 21.

Tribe ECTROMATINI

Tanaomastix,⁵ n. gen.

FEMALE

Head as wide as thorax, submenisciform, thin anteroposteriorly, the face to a slight degree inflexed; seen from in front, subcircular in outline with cheeks converging toward mouth at nearly a right angle, about as wide as long; seen from the side, in outline subtriangular, the facial side longer than the dorsal side, the latter being convexly rounded; occiput concave, the neck inserted near the center, the occipito-vertical margin acute; frontoververtex rather broad, as wide as long, the ocelli in a right angle, the posterior pair farther removed from eye-margin than from the occipital margin; eyes large, broadly oval, a little wider on lower half, the dorsal orbits nearly parallel, posteriorly reaching to the occipital border; face reaching considerably upward between the eyes, a little longer than wide, the scrobes distinct but not deep, converging above but not meeting, separated by a very slightly arched ridge, which is hardly visible in side view of head; cheeks short and narrow, hardly longer than one-half the width of the eyes; mandibles normal for tribe, long and narrow with two acute teeth; antennae (fig. 7, B) inserted close

⁵ From *ταναός*, tapering, long, and *ἡ μάστιξ*, whip, in reference to the antennae.

to a line drawn between the lower corners of the eyes, about equidistantly from each other as from eyes and clypeal margin, in form long and slender as in *Leptomastix* (Förster) Mayr, the scape flattened but hardly expanded, the pedicel about equal to the first funicle joint, the funicle filiform; all the joints much longer than thick, not increasing in width distad, the club after collapsing a little thicker than the funicle and a little longer than the last two joints combined. Thorax short and thick, the dorsum but slightly convex; pronotum short, arcuate; mesoscutum about twice as wide as the median length; axillae lying in same plane with scutellum, meeting or nearly meeting medially; scutellum flat, abruptly declivous at the sides, the apex rounded; metanotum and propodeum both short, almost divided medially, the side pieces triangular, the propodeum also very abruptly

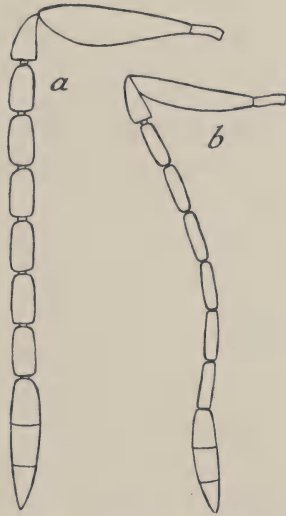


Fig. 7. *Tanaomastix*: A, female antenna of *T. claripennis*; B, same of *T. abnormis*.

deflexed and overlapped by the abdomen; legs long and slender, the middle tibiae noticeably longer than their femora, the spur a little shorter than the first tarsal joint, which is almost as long as the following four combined, hind tibia with one small apical spur; wings narrow, elongate, the costal cell very narrow, marginal cilia short, marginal vein about three times as long as thick, the stigmal slightly longer, straight and enlarged at apex, the post-marginal considerably longer than the stigmal; hind wings

linear, the costal cell extremely narrow or evanescent, the vein but slightly bent. Abdomen as seen from above acutely triangular in outline; the dorsum deeply concave, the venter strongly compressed; the ovipositor entirely enclosed within the fifth sternite which reaches to the apex; the vibrissal plates situated at the base and withdrawn within the dorsal concavity.

Sculpture entirely alutaceous, the frontovertex much more coarsely so or closely granulose, pubescence on head scanty and very fine, on mesonotum more evident and arising from microscopic punctures. Coloration non-metallic.

MALE

Not differing noticeably from the female except in the structure of the antennae, which are somewhat longer, the scape about the same, the pedicel much shorter than the first funicle joint or hardly longer than thick, the funicle joints all elongate, slender, incised at each end above except at base of first joint, each clothed with rather long erect hairs arranged in three whorls, the apical whorl somewhat incomplete on lower side, club solid, no thicker than the funicle, and about one-half longer than the preceding joint; the abdomen also does not become sunken in, and the dorsum is more coarsely sculptured than in the female.

TYPE OF GENUS

***Paraleptomastix abnormis* Girault**

The two other species so far known show but little deviation from the above description based entirely on *P. abnormis*, the chief differences residing in the shape of the head, and the length of the middle tibial spur in comparison with the first tarsal joint as brought out in the following descriptions and notes.

The genus is most closely related to *Leptomastix* (Förster) Mayr, which differs in having the head menisciform, the face not at all inflexed, the scrobes meeting above and separated by a strongly arched ridge prominently visible in side view of head; the antennae inserted higher up or between lower corners of eyes; the pedicel not over one-half as long as the first funicle joint; the funicle clothed with stiff bristle-like hairs in the female, and with longer hair in the male arranged in three whorls on basal three joints and in two whorls on apical three; the club in male with a fringe of short bristles on lower margin of basal half; thorax more convex; wings wider and the postmarginal

variable, in *P. histrio* and *P. dactylopii* not longer than stigmal, but in an undescribed species considerably longer. (The above characters based mainly on *L. dactylopii* Howard.)

Paraleptomastix Girault does not seem to be so closely related, as it is a large, robust form of different sculpture and metallic coloration; the head menisciform, the scrobes very short (no facial ridge mentioned by Girault), the antennae slenderly clavate, the funicle joints becoming shorter and thicker distad, the sixth being a little wider than long, the pedicel less than half as long as the first funicle joint; wings probably much wider than in *Tanaomastix*, as the costal cell is wide; stigmal vein curved, longer than the marginal; the hind legs compressed, the femora narrowly exfoliate.

The species of *Tanaomastix* are parasitic in mealybugs of the genus *Pseudococcus* so far as known. In life the wings are held semivertically erect over the back, at least in *abnormis*, a habit quite unique among the Encyrtinae.

***Tanaomastix claripennis*, n. sp.**

Fig. 7, A

FEMALE

Head wider than in *T. abnormis*, the frontovertex about one-fourth wider than long and coarsely alutaceous or granulose; ocelli large, in an obtuse-angled triangle, the posterior pair about their own diameter from the occipital margin and fully twice as far from the eye-margin; eyes about one-fifth longer than wide, with a fine, sparse pubescence; cheeks about as long as the width of eyes; face as wide as long, the antennal scrobes narrow, rather deep and not uniting above, the facial ridge hardly elevated. Antennae (fig. 7, A) noticeably less slender than in *abnormis*; the scape somewhat expanded below, its greatest width just distad of the middle a little more than one-fourth the length exclusive of the radicle; pedicel as long as the first funicle joint; funicle joints about equal, all about twice as long as wide; club hardly wider than funicle, as long as the two preceding joints and one-half of the next combined, its three joints subequal, the apex pointed. Wings considerably wider than in *abnormis*, uniformly ciliated; the speculum wide, not quite reaching stigmal vein nor more than three-fifths of the distance to the posterior margin. Legs as in *abnormis*, except that the middle tibial spur and the first tarsal joint are each considerably shorter than the last four tarsal joints combined. Length, 1.0 mm.

Frontovertex orange yellow, with the occipital margin dusky; face, cheeks and sides of head yellowish white, the cheeks slightly dusky on the sides; the face with a narrow, dark brown band on each side connecting the lower corner of the eye with the base of the antenna; occiput dilute blackish brown; the notum of thorax and apical half of abdomen above and below brownish black, the lateral margin of mesoscutum and the axillae pale orange yellow, the metanotum, propodeum, metapleura and basal half of the dorsum of abdomen pale brown; underparts of thorax otherwise yellowish white, and most of the basal half of the venter dusky white. Antennae dark brown, the scape with a white triangular spot on the outer and inner surface beginning almost at the base, not quite reaching the dorsal margin but reaching to the middle on the ventral margin, with a narrow, oblique, curved band running from the dorsal margin a trifle beyond the middle to the ventral margin just before the apex. Legs yellowish white, the middle coxae dark brown, the fore and hind tibiae on dorsal margin, all femora on dorsal margin at apex, and the fore and hind tarsi, pale brownish or dusky, the middle tibiae and tarsi very dilute brownish yellow with the first tarsal joint and the spur whitish. Wings hyaline, the veins brown. Pubescence of thorax pale brown and inconspicuous.

Described from two females (type and paratype) reared from *Pseudococcus ryani* (Coquillett), Pasadena, California (C. P. Clausen), Clausen no. 56.

***Tanaomastix abnormis* (Girault)**

Fig. 7, B

Leptomastix sp. Viereck, Monthly Bulletin, Cal. State Comm. Hort., vol. 4, p. 208, fig. 36-38, April, 1915.

Paraleptomastix abnormis Girault, Entomologist, vol. 48, p. 184, August, 1915.

Paraleptomastix abnormis H. S. Smith, Jour. Econ. Ent., vol. 10, p. 262-68, figs. 9-13, pls. 13-14, April 21, 1917.

As compared with *T. claripennis* this species has the frontovertex no wider than long, the face longer than wide, with the facial ridge more elevated, the antennae (fig. 7, B) much slenderer, each funicle joint being about three times longer than thick, and the middle tibial spur considerably longer. It has about the same coloration, excepting the following points: the frontovertex paler orange yellow, the face without dark marks, the notum of thorax varying from dark to pale brown, the base

of the abdomen more whitish, the legs paler, the scape of the antenna except the dorsal margin and the apex of the pedicel white, and the wings conspicuously trifasciate, the bands due both to integumentary pigment and to the ciliation.

A female reared from a *Pseudococcus* on *Citrus* (not *Pseudococcus citri* Risso), Okitsu, Japan, July, 1914 (Kuwana), California State Insectary no. 783, is entirely similar to specimens from Sicily, except that the blackish streak on the dorsal margin of the scape does not quite reach the apex. This species has been introduced into southern California from Sicily to help reduce the citrus mealybug (*Pseudococcus citri* Risso), and, according to the latest reports, has become established.

***Tanaomastix albiclavata* (Ashmead)**

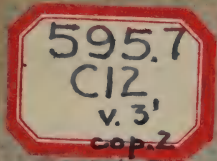
Aphycus albiclavatus Ashmead, Proc. U. S. Nat. Mus., vol. 29, p. 404, 1905.

This species as compared with *T. abnormis* has a thicker, narrower head, with the frontovertex nearly twice longer than the posterior width, the dorsal orbits of eyes slightly converging behind, the ocelli in an acute angle, the posterior pair close to the eye-margin, the scape subexpanded below, the scutellum more acute at apex, and the spur of the middle tibiae fully one-half as long as the tarsi.

The above notes are based on one female from the Philippine Islands (undoubtedly from the vicinity of Manila), reared from a *Pseudococcus* species, and received from the California State Insectary. It agrees with Ashmead's type specimen, which is a female, and not a male, as stated in the original description.

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A SYNOPSIS OF THE *APHIDIDAE* OF CALIFORNIA*

BY
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* Paper no. 51, University of California, Graduate School of Tropical Agriculture and Citrus Experiment Station, Riverside, California. Manuscript submitted for publication May 20, 1918.

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INTRODUCTION

In recent years considerable attention has been paid to the Aphididae in the United States, and in Europe as well, and a large amount of literature is the result. In California, W. T. Clarke was the first to make any systematic studies of these insects and his paper, published in 1903, embodies the results of these studies. He listed forty-three species, ten of which were described as new. Two or three of his new species are known at present, but the remainder are unknown. Unfortunately his collection was destroyed in the earthquake of April, 1906, so now it is practically impossible to determine his new species with any degree of accuracy. Following this, there was a period of six years in which there were no publications concerning the Aphididae of California, except some economic bulletins from the Experiment Station. In 1909, both E. O. Essig and W. M. Davidson published the results of their earlier studies. Since then both have added papers occasionally. During 1912 and shortly before, Harold Morrison made an extensive study of the species in the vicinity of Stanford University. He has kindly placed a report of his studies in the author's hands, with permission to publish the records in this paper. The author has been studying the Californian species continuously since 1914.

At present there are about one hundred and eighty species known to occur in California. This number will undoubtedly be greatly increased as further studies are made, since to date only a comparatively small part of the state has been covered by collectors. Very extensive collections have been made in Ventura County and in the vicinity of Pomona College, Los Angeles County, by Essig. The San Francisco Bay region, particularly in the vicinity of the University of California and Stanford University, has been carefully surveyed for aphids, collections having been made by Clarke, Davidson, Essig, Morrison, Ferris, and the author. Davidson, Clarke, and Essig have made a few observations in the Sacramento Valley, particularly in Placer and Sacramento counties. The author made a number of

observations in the vicinity of Fresno during May and June, 1915, and more or less extensive observations and collections during 1916 and 1917 in San Diego, Riverside, Orange, Los Angeles, and San Bernardino counties. In addition to these, reports come to the College of Agriculture occasionally from the State Insectary and the various county horticultural commissioners. A summary of the above statements shows that extensive collecting has been done only in the territory adjacent to San Francisco Bay, and throughout southern California. The whole northern half of the state, the great interior valleys of the Sacramento and San Joaquin rivers, and the desert sections of the southeastern part of the state are as yet unexplored. Undoubtedly many interesting species will be found in these parts.

The author wishes to express his appreciation of the aid rendered by various people during the past three years of study. To Harold Morrison of the Federal Board of Horticulture is due especial thanks for his assistance during the early part of the author's study, for his collection notes, and for the use of his extensive collections of Stanford University vicinity and Indiana; to E. O. Essig of the University of California for his continuous advice and assistance, for the use of his large collections of Californian species, and for the reading of this manuscript; to W. M. Davidson of the Bureau of Entomology, U. S. Department of Agriculture, for his many notes and determinations and for the use of his collection; to A. C. Baker, J. J. Davis, C. P. Gillette, A. S. Maxson, E. M. Patch, and H. F. Wilson for their many determinations and suggestions; to R. W. Doane of Stanford University for the permission to work over his collection of Utah aphids and for permitting his students to use the keys included in this paper, thereby finding the weak points in the keys; and finally to G. F. Ferris of Stanford University for collections and advice.

In this paper the author has brought together all the present records of California Aphididae. He has included keys for the determination of the subfamilies, groups, genera, and species, together with such illustrations as are necessary for an understanding of the keys. The discussion of each species includes a bibliography of the California literature (exclusive of the merely economic and popular), together with a citation of the original description and the best available description, a list of host plants and localities, and a discussion of the synonymy, life history, and habits so far as they are known. The descriptions of certain species are not readily accessible and of others not at all adequate. Such species have been redescribed

by the author in so far as it was possible to obtain specimens. Incidentally it may be stated that the author has personally collected by far the larger number of the species recorded in this paper. In other cases the fact is noted. A host plant index (appendix 2) is also included.

The system of classification followed is the one most generally accepted by American aphidologists at the present time. The keys to the species have been formulated by the author, those to the genera and higher groups have to a large extent been adapted from other workers, particularly Wilson and Essig (Aphidinae), Börner (Phylloxerinae), and Tullgren (Pemphiginae). The papers of Baker, Clarke, Davidson, Davis, Essig, Gilllette, Oestlund, Patch, Pergande, Williams, Wilson, and other American aphidologists have been found invaluable. Of the works of the European aphidologists, those of Börner, Buckton, Del Guercio, Koch, Mordwilko, Tullgren, and Van der Goot have been in constant use. The classification suggested by Van der Goot ("Zur Systematik der Aphiden," in *Tijdschrift voor Entomologie*, vol. 56, p. 1913) has proved interesting, and although the author has not felt at liberty to accept it in full, a translation of his keys to the groups and genera has been included herewith (appendix 1), which, it is hoped, will be of assistance in the making of determinations.

CLASSIFICATION

The Aphididae belong to the order Homoptera, being closely related to the Psyllidae, or jumping plant lice, the Aleyrodidae, or white flies, and the Coccidae, or scale insects. The Aphididae, or plant lice, are small, soft-bodied insects, ranging from less than one to five or six millimeters in length. Typically there are four forms: the apterous and the alate viviparous females, and the sexual forms, the oviparous females and the males. There is considerable variation from the above in different groups and species, as will be pointed out under the discussions of the various species. The alate viviparous females are the individuals most commonly taken by the collector and the ones that usually show the best characters for determinations. In the keys in this paper all characters refer to the alate viviparous females (the *alates*) unless otherwise mentioned.

EXTERNAL ANATOMY

The body¹ consists typically of three divisions, the head, thorax, and abdomen. In the apterous forms the mesothorax and metathorax are closely fused with the abdomen, while the prothorax and head are distinct. In the alate forms the mesothorax and metathorax are fused together and appear as a distinct division, the body appearing to consist of four divisions, viz., the head, the prothorax, the mesothorax and metathorax, and the abdomen.

The head bears a pair of compound eyes, usually three ocelli, a pair of three to six jointed antennae, and the beak. Of these, the antennae show the best characters for determinations, not only of species but of higher groups. They are either mounted on distinct tubercles (Macrosiphini, certain Callipterini) or appear to arise from the front of the head. They consist of from three to six segments, the terminal one of which is usually provided with a projection or spur. They are six-segmented in the Aphidinae (except *Essigella* and *Cerosipha*), five- or six-segmented in the Pemphiginae (except in the stem mothers of certain genera), and three-segmented in the Phylloxerinae (except in *Chermisina*, in which the alate forms have five-segmented and the sexual forms four-segmented antennae). The spur of the terminal segment may be equal to or longer than the segment (Aphidinae, in the Macrosiphini it attains its greatest length, often being as much as ten times the length of the base); it may be merely a short thumblike process (Pemphiginae, Lachnini, and certain Callipterini); or it may be apparently lacking (Phylloxerinae). The two basal segments are always short, and quite regular in all species. The remaining segments show the greatest diversity, particularly in number, size, and shape. Sensoria are always present on some of the segments. There is one primary sensorium always present at the distal end of the terminal segment, and when the antennae consist of more than three segments, one also at the distal end of the penultimate segment. These sensoria are fairly large and clear (sometimes furnished with a hairy fringe) and are more or less circular. The accessory sensoria are a group of small indistinct sensoria, which number from three to six, and which are located in close proximity

¹ For a fuller discussion of the external characters consult the following papers: Vickerey, R. A., A comparative study of the external anatomy of plant lice, 12th Rept. Minnesota State Entomologist 1908; Sanborn, C. E., Kansas Aphididae, Kansas Univ. Sci. Bull., vol. 3, 1904; Mordwilko, Alexander, Keys to the groups and genera of the Aphididae, Ann. Mus. Zool. Imp. Acad. Sci. St. Petersburg, vol. 13, pp. 362-364, 1908.

to the primary sensorium on the terminal segment. Secondary sensoria are usually present in the alate forms, but oftentimes absent in the apterae of certain species. When present they are always on the third segment, but in antennae consisting of five or six segments, they may be present upon the fourth, fifth, and even sixth segments. In the Pemphiginae they are arch-like or half rings, or form complete rings about the segments. In the Aphidinae they are circular, oval, or transversely linear, but are never rings or half rings. The shape and number vary considerably, and are of specific importance. The number may vary from as few as three or four (*Myzocallis maureri* Swain), to as many as forty to fifty on the third segment, and many also on the fourth and fifth (*Myzus braggii* Gillette). Unfortunately these highly important characters were overlooked or not taken into consideration by the earlier workers. The beak is four-jointed and seems to arise from between the fore legs. It is always present (except in the sexes of certain of the Phylloxerinae), but is seldom of specific importance (except to distinguish *Aphis bakeri* Cowen from *Aphis senecio* Swain, and in certain of the Lachini). It may be very short, as in *Aphis bakeri* Cowen, where it reaches only slightly beyond the first coxa, or it may be very long as in *Stomaphis*, where it is from one and one-half to two times as long as the body. In leaf-feeding species it is usually short, while in bark-feeding forms it is longer. This is naturally necessary, for those that live on thick bark must have a longer beak in order to reach through to the plant juices.

The thorax consists of three divisions, the last two of which are usually more or less fused together, and considered as one; the two divisions being called, in this paper, the prothorax and the thorax. On the lateral margins of the prothorax there is sometimes a pair of small tubercles. These are not present in all species, however, and they differ considerably in size in the various species. There are three pairs of fairly long and slender legs (except in Phylloxerinae, where the legs are greatly atrophied, approaching those of the Coccinae in size). Typically the legs consist of four joints, the coxa, the femora, the tibia, and the tarsus. In some genera the tarsi may be atrophied (*Atarsos*, *Mastapoda*). The comparative lengths of the first and second segment of the tarsi are sometimes of generic importance (Lachnini), and the comparative lengths of the hind tarsi and the cornicles are oftentimes of specific importance (*Aphis*, *Pterocomma*). A small empodial hair is found between the claws in the Aphidinae. In the Callipterina it is leaf-shaped or spatula-like. In

the Aphidina and Lachnina it is hair-like, usually being as long as the claws (except in the Pterocommini, in which it is considerably shorter than the claws). The wings are membranous and hyaline (except in certain Callipterini, Lachnini, and Macrosiphini), and are held roof-like over the body when at rest (except *Monellia*, Phylloxerinae, Hormaphidina, in which they lie flat on the abdomen). The veins of the fore wings are as follows: the costal and subcostal are almost parallel with the anterior margin; the radial extends from the posterior margin of the stigma to the outer margin of the wing, being either curved or straight; the discoidals, three in number, extend from the subcostal to the posterior margin of the wing. The outer or third discoidal (*media*, *cubitus* of some authors) may be simple (Hormaphidina, Pemphigina), absent (Phylloxerinae), once-branched (Schizoneurina), or twice-branched (Aphidinae, except *Toxoptera*). On the anterior margin of the fore wing is a dusky spot located between the wing margin and the subcostal veins, and between the distal ends of the costal and subcostal veins, known as the stigma or Pterostigma. It is usually trapezoidal in shape, and does not extend to the tip of the wing (except in *Longistigma* and *Mindarus*, in which it reaches well beyond the tip of the wing). The hind wings have one longitudinal and either one or two transverse veins.² In the Pemphiginae and Phylloxerinae dorsal wax glands are sometimes present on the thorax, in which case their number, shape, and position are of more or less specific importance.

The abdomen consists of nine more or less similar segments. The coloration of the various segments, especially in species in which the color is variegated, is sometimes of specific importance. In certain species wax glands are present on the abdomen (Phylloxerinae, and particularly the stem mothers of Pemphiginae) and may be of use in making determinations. In the Aphidinae the presence or absence and location of small lateral and dorsal tubercles are often important. The anal segment consists of an anal plate and a cauda. The cauda may not be separated from the abdomen (Pemphiginae, Lachnina), or it may be short and conical (Aphidini), short and globular, being constricted in the middle (Callipterina), or it may be long and ensiform or sickle-shaped (Macrosiphini). The anal plate is usually well rounded, being half-moon-shaped, or it may be emarginate or bilobed (Callipterina). On the sixth (or fifth?) segment is a pair

² For a full discussion of the venation see Patch, Edith M., Homologies of the wing veins of the Aphididae, Psyllidae, Aleurodidae, and Coccidae, Ann. Entom. Soc. Am., vol. 2, pp. 101-136, June, 1909.

of short tubular processes, the cornicles (honey tubes, nectaries of some authors). These are quite valuable characters, both specific and generic. In the Phylloxerinae and most of the Pemphiginae they are lacking, but in the Aphidinae they are always present, and show a great diversity of form. They may be merely pores (certain Callipterini, *Cerosipha cupressi* Swain, *Lachnus taxifolia* Swain), they may be cylindrical, yet quite short (certain Callipterini, Chaitophorini); they may be short and cylindrical or conical (Aphidini); they may be truncate, cone-shape (Lachnini); they may be clavate and long (certain Callipterina, Pterocommini, Macrosiphini); or they may be long and cylindrical (particularly in *Macrosiphum* and *Myzus*).

BIOLOGY

Considerable variety is exhibited in the habits, life history, and methods of reproduction, as well as in the structure and body form. Reproduction is almost entirely parthenogenetic, although certain species at certain times have a sexual reproduction. Fewer species have sexual reproduction in California than in colder climates, due to the fact that mild weather throughout the winter permits them to live over, and hence the eggs are unnecessary. Many species produce generation after generation parthenogenetically, and are most abundant in the spring and early summer, but gradually disappear toward midsummer, due partially to their predaceous and parasitic enemies, and partially, undoubtedly, to the heat of the summer. Other species regularly produce sexual forms in the fall, which lay eggs that hatch the next spring. The forms hatching from the eggs are wingless (except in Callipterini) and usually of a different form from the later generations, and are known as the fundatrix or stem mother. The fundatrix is always viviparous. Her progeny consists either of all apterous or partly apterous and partly alate viviparous females (fundatrigenia), which in turn produce other generations of fundatrigeniae. The last asexual generation in the fall, which gives birth to the sexual forms (sexuales), are known as sexupara, and are usually alate. Oftentimes in the second or third and even fourth generation there is a definite migration from one species of host plant to another, where the aphids live over the summer (virgogenia), the sexupara returning to the original species of host in the fall to give birth to the sexuales, which lay their eggs there. *Aphis malifoliae* Fitch represents an example of this habit, the winter host being apple, the summer plantain. Oftentimes the fall migrants (sexupara) of certain

species differ considerably in structure from the spring migrants (fundatrigenia). This is particularly noticeable in the Pemphiginae. Many species are confined throughout the season to one species of host, others to one or two or a few species, while still others may live on any of a number of hosts (*Aphis senecio* Swain, *Rhopalosiphum persicae* (Sulz.)). All sustenance is derived from the plant juices of the various hosts, but each species is usually confined more or less definitely to feeding on some certain part of the plant. Some live entirely upon the leaves, some on the stems of the leaves and small twigs, some on the trunks and larger branches, some on the roots, some on the flower heads and racemes of the host, and still others feed on almost any part of the plant. The greater number of species are free living, but certain of the Aphidinae form pseudogalls (*Aphis pomi* De Geer, *Aphis malifoliae* Fitch, *Phyllaphis coweni* (Cockerell)), while the Pemphiginae and Chermisina form true galls. Nearly all of the Pemphigina spend at least part of the season on various species of *Populus*, the Schizoneurina on *Ulmus*, while the Lachnini and Chermisina are practically confined to the conifers. The Aphidinae are found mostly on deciduous trees and herbaceous plants, although some live on conifers (*Myzaphis abietinus* (Walker), *Nectarosiphon morrisoni* Swain).

ECONOMIC CONSIDERATIONS

From an economic standpoint most of the species are of no importance, although there are many that are well known pests of cultivated crops. For example the woolly apple aphid (*Eriosoma lanigera*) is a world-wide pest of considerable importance to the apple. The green and the rosy apple aphid (*Aphis pomi*, *A. malifoliae*) do a large amount of injury in certain localities, and are extremely difficult to control. The rose aphid (*Macrosiphum rosae*) is known the world over, and although living unprotected and easily killed with any of the common contact insecticides, it is recognized by everyone who has grown roses in the dooryard as an extremely troublesome pest. The walnut aphid (*Chromaphis juglandicola*), the cabbage aphid (*Aphis brassicae*), the green peach aphid or greenhouse aphid (*Rhopalosiphum persicae*) are all well known pests. The common contact insecticides are usually efficient for their control. Many species are kept well in check by their predaceous and parasitic enemies, the ladybirds, the syrphid flies, the lacewings, and the braconids. Of the ladybirds, probably the most efficient in California are *Coccinella californica*

Mann., *Hippodamia convergens* Guerin, and *Scymnus nebulosus* Leconte. Of the syrphid flies, those consuming the largest number of aphids and the most abundant in the state³ are *Catabomba pyrastris* Osten-Sacken, *Allograpta obliqua* Say, *Syrphus arcuatus* Fallen, *S. americanus* Wied., *S. opinator* Will., and *Eupeodes volucris* Osten-Sacken. *Chrysopa californica* Coq. and *Symphorobius angustus* Banks are the most important aphid enemies among the lacewings. Among the Braconidae there are two very common species in California, *Lysiphlebus testaceipes* Cresson and *Diaretus rapae* Curtiss. Others have been reared by the author and will be mentioned later. The author wishes to thank Dr. L. O. Howard and Mr. A. B. Gahan of the Bureau of Entomology for their kindness in identifying the various hymenopterous parasites of aphids sent to them.

SYNOPSIS

Family **Aphididae** Passerini

Passerini, Gli Afidi, 1860.

The family Aphididae Passerini is divided into three subfamilies (following Alexander Mordwilko), which are: Aphidinae Buckton, Pemphiginae Mordwilko, and Phylloxerinae Dreyfus. Van der Goot considers but two subfamilies: Aphidinae v. d. G. and Chermisinae v. d. G. His subfamily Aphidinae includes both the Aphidinae and Pemphiginae of Mordwilko, while his Chermisinae is the same as Mordwilko's Phylloxerinae. Following is a translation of Van der Goot's descriptions of the two subfamilies:

Subfamily *Aphidinae* v. d. G.: Body very often without distinct groups of glands for the secretion of wax. Antennae usually six- or seven-jointed [when the terminal process of the sixth segment is longer than the segment he considers it as the seventh segment]. Only in a few cases are the apterous forms with three-segmented antennae. The primary sensoria usually have a distinct "haarkranz" [hairy fringe?]. Cornicles almost always and cauda often present. Fore wings with four veins, the cubitus or media I very often divided: hind wings usually with two cross-veins. Vivi-oviparous: the sexuales mostly of the usual form.

Subfamily *Chermisinae* v. d. G.: Body almost always with distinct groups of glands for the production of wax. Antennae three-segmented, often evidently five-segmented. Sensoria always without "haarkranz." Cornicles always absent. Fore wings with three veins; hind wings with only one small vein. Always only oviparous: sexuales dwarfish, with or without beak.

³ Davidson, W. M., Syrphidae in California, Jour. Econ. Ent., vol. 9, pp. 454-457, 1916.

The latter subfamily has been considered by the author as Phylloxerinae Dreyfus; the former as two subfamilies, Aphidinae Buckton and Pemphiginae Mordwilko. Mordwilko gives the following characters for these two subfamilies:

Subfamily *Pemphiginae* Mordw.: Antennae of the alate forms five- or six-segmented, the third bearing a specifically definite number of transverse or arch-like sensoria; short, usually not longer than the head and thorax. The apterous parthenogenetic females have four- to six-segmented antennae, but these are sometimes reduced to three or even to two segments. The fore wings of the alate forms have four transverse veins, of which the third or cubital vein [third discoidal] is either simple or once-branched. The hind wings have one or two transverse veins. The cornicles are either entirely absent or very slightly developed, and in the latter case may not be present in all the forms of one species.

Subfamily *Aphidinae* Buckton: Antennae always six-segmented, except in the stem mother of some species, and in the genus *Sipha* Passerini. [This genus is not represented in California. In *Essigella* Del Guercio, *Cerosipha* Del Guercio, and *Trifidaphis* Del Guercio, three Californian genera described since the publication of Mordwilko's paper, the antennae are but five-segmented.] The last antennal segment often ends in a long thread-like filament which may be longer than the segment. Antennae with a long filament are mostly from half the length of the body to longer than the body. The antennal filament is characteristic only for this subfamily; some genera of the groups *Lachnina* and *Callipterina* have a very short filament, and the antennae are not longer than the head and thorax. The sensoria are small and are shaped like dots, circles, or transverse holes, but never archlike or half-rings. Segment 3 bears the largest number, especially in the alate forms. The cubitus [third discoidal] of the fore wings is usually twice-branched although there are some exceptions, as *Toxoptera* Koch. Most species have long cylindrical cornicles which are often clavate in the middle. Sometimes they may be greatly reduced or poorly developed, and, as in *Lachnina* and *Callipterina*, they may be replaced by cupola-shaped elevations. A cauda is usually present, being conical, ensiform, or globular, although in *Lachnina* it is not evident. The sexual forms have beaks, and become quite large.

Subfamily **Aphidinae** Buckton

Buckton, Mono, British Aphides, 1883.

This subfamily is divided into three groups, following Carl Börner (Sorauer, Paul, Handbuch der Pflanzenkrankheiten, vol. 3, p. 664, 1913). Börner considers the family Aphididae as a superfamily, and divides it into four families; so this subfamily Aphidinae he considers a family, and the various groups as subfamilies. Below is a translation of his key:

1. Claws with spatula-like or leaf-shaped empodial hairs (fig. 1). Cornicles variously formed, bare. Pubescence of larvae as in Aphidina. The majority of the species live free and monophagous on trees, only seldom on herbaceous plants, and never migrate collectively Group **Callipterina**
- Claws with simple empodial hairs (fig. 2), often hard to see 2

2. Antennae with short terminal joint (fig. 3), (except in Pterocommini, but then the cauda is not tail-like). Body ridges with more than six longitudinal rows of hairs. Hairy covering mostly thick. Cauda not lengthened tail-like, anal plate widely rounded (fig. 5). Wax glands either present or lacking. Mostly strongly monophagous forms, at times of remarkable size. Found mostly on tree growths and without change of hosts Group **Lachnina**
- Terminal joint of antennae always with a long, slender filamentous projection (fig. 4). Body ridges of young larvae at most with only six longitudinal rows of hairs, which may be increased after the first molt. Cauda either short or lengthened tail-like, anal plate widely rounded (fig. 6). Species monophagous or polyphagous, many with a change of host plants. On tree or herbaceous growths Group **Aphidina**

Group **Callipterina** Mord

(Subfamily **Callipterinae** Börner)

Mordwilko, Ann. Imperial Acad. Sci., St. Petersburg, 1908.

Börner, in Sorauer, Handbuch der Pflanzenkrankheiten, vol. 3, p. 664, 1913.

According to Börner this group consists of two tribes, the Phyllaphidini and the Callipterini. He divides the Callipterini into two groups, the Callipterini and the Chaitophori. The author has followed him to a certain extent, but has given each of the last two groups equal rank with the Phyllaphidini, and thus considers this group, Callipterina, as consisting of three tribes. Below is a key to the same:

1. Wax glands with faceted pore fields present. Antennae as in Lachnina (fig. 13). Pubescence delicate Tribe **Phyllaphidini**
- Wax glands lacking or without faceted pore fields. Pubescence often very remarkable. Terminal joint of the antennae often lengthened into a bristle (fig. 30) 2
2. Anal plate more or less emarginate or bilobed (fig. 7), except in *Euceraphis* Koch Tribe **Callipterini**
- Anal plate widely truncate or rounded (fig. 8) Tribe **Chaitophorini**

Tribe **Phyllaphidini** Börner

Börner, in Sorauer, Handbuch der Pflanzenkrankheiten, vol. 3, p. 664, 1913.

This tribe Phyllaphidini consists of but one genus, *Phyllaphis* Koch, which is represented in California by three species.

1. Genus **Phyllaphis** Koch

Koch, Die Pflanzenläuse, p. 248, 1857. Type *Aphis fagi* Linn.

KEY TO CALIFORNIA SPECIES

1. Alate viviparous females unknown. Wing venation of alate males similar to that of *Eriosoma* spp. (fig. 17). Forming pseudogalls on edges of leaves or living free in masses of white flocculence on leaves of *Quercus* spp.
quercicola Baker

- Alate viviparous females common. Venation normal, the third discoidal being twice-branched. Not on *Quercus* spp. 2
- 2. Antennae short, stout, with oval transverse sensoria (fig. 13). Forming galls on *Arctostaphylos* spp. (and *Arbutus* spp.) **coweni** (Ckll.)
- Antennae longer and narrower with circular sensoria (figs. 9, 14–17). Living under thick masses of white flocculence on *Fagus* spp. **fagi** (Linn.)

1. *Phyllaphis coweni* (Ckll.)

Figure 13

Cockerell, Can. Ent., vol. 37, pp. 391–392. 1905. *Pemphigus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 4, pp. 559, 1911. *Cryptosiphum tahoense* n.sp. (desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 404, 1912 (list).

Essig, Pom. Jour. Ent. Zool., vol. 7, pp. 187–195, 1915 (desc.).

Records.—*Arctostaphylos manzanita*; Oakville, Napa County, February, 1913 (E. L. Brannigan); Mount Diablo, Contra Costa County (Davidson); Jasper Ridge, Santa Clara County, October, 1914 (E. A. Cornwell); Pine Hills, San Diego County, June, 1916.⁴ *A. pumella*, *A. tomentosa*, Lake Tahoe, August, 1911 (Davidson); *A. glauca*, Alpine, San Diego County, June, 1916.

This species is found more or less abundantly throughout the state wherever its host plants occur. Essig (1915) states it is found throughout the Rocky, Sierra Nevada, and Coast Range mountains, being more abundant in the central and northern parts of the state. The author has found it to be extremely abundant in the Cuyamaca and Laguna mountains in the extreme southern part of the state. The insects can be found at any time of the year in the galls on *manzanita* although most abundantly in the early fall. Collections by the author in June showed that the stem mothers and young virginogeniae only were present. A few weeks later the alate females were abundant, while in August the sexuales begin to appear. However, the alate viviparous females have been found in October and in February. This species forms galls on the leaves, and flower and fruit stalks of its host. Usually there is but one gall to a leaf, although sometimes four or five may be found. When first formed these galls are concolorous with the leaves; but as they become older they turn more and more reddish in color, until when mature they are a very bright red.

2. *Phyllaphis fagi* (Linn.)

Figures 9 to 12

Linnaeus, Syst. Nat., vol. 2, p. 735, 1735. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910 (list).

Records.—*Fagus* sp., Palo Alto, 1910 (Davidson); *Fagus sylvatica*, Stanford University, April to May, 1915.

⁴ Records in which no collector's name is mentioned refer to collections made by the author.

This species has been taken only in the vicinity of Stanford University, where it infests copper beach (*Fagus sylvatica*). It may be easily recognized by the masses of whitish flocculence on the under side of the leaves. Each mass contains one individual, which is entirely hidden by it. In looking up the literature of this species the author found that there has been no description of it published in America, so below is included a brief description of specimens taken near Stanford University on April 28 and May 29, 1915.

Alate viviparous female.—Prevailing color dark green, covered with a whitish flocculence. This flocculence consists of wax threads as much as 3 mm. long. Head dusky, with frontal margin black. Eyes red. Antennae dusky, except II and basal one-third of III, which are pale. Beak pale with apex and joints dusky. Thorax dusky green with lobes black. Abdomen dark green with a row of black spots on each margin and about seven black transverse dorsal bands. Cornicles black. Cauda and anal plate concolorous with abdomen with distal margins slightly darker. First and second femora pale with apices only dusky; third femora dusky throughout. First tibiae pale with apex dusky; second and third dusky throughout. Tarsi black. Wings hyaline, stigma gray.

Head twice as wide as long, furnished with many small wax glands. Antennae reaching to the cornicles or to the base of the cauda, set on small tubercles (fig. 12). III is the longest segment, followed by IV, V, and VI. VI spur is merely a thumb-like projection (fig. 16). The usual primary and accessory sensoria are present on V and VI. Secondary sensoria are found only on III (fig. 9). These are fairly large, almost circular, and placed in a single row along the segment. They number from four to seven, five being the average. The beak is short, reaching but slightly beyond the first coxae. The wings are normal, with a twice-branched third discoidal. The cornicles are merely small pores. The cauda is short and knobbed, the anal plate emarginate or bilobed (fig. 11).

Measurements: Body length 2.0 to 2.4 mm., width 0.8 to 1.04 mm., antennae total 1.55 to 2.06 mm., III 0.591 to 0.77 mm., IV 0.34 to 0.47 mm., V 0.27 to 0.39 mm., VI 0.19 to 0.25 mm., cornicles (diameter) 0.05 mm.

Apterous viviparous female.—Prevailing color under flocculence pale yellowish green. Light brown markings as follows: two rows of four spots each across the prothorax, one large spot on each margin and one on the dorsum of the thorax, four spots on each abdominal

segment, two dorsal and two marginal. Antennae pale except VI, apical two-thirds of V, and apical one-third of IV. Legs pale with light brown spots at joints; tarsi black. Cauda small and conical, cornicles not evident.

Measurements: Body length 2.9 to 3.0 mm., width 0.96 to 1.2 mm., antennae total 1.26 mm., III 0.36 mm., IV 0.32 mm., V 0.204 mm., VI 0.205 mm.

3. *Phyllaphis quercicola* Baker

Figures 14 to 20

- Clarke, Can. Ent., vol. 35, p. 248, 1903. *Schizoneura querci* (Fitch) (list).
Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910. *S. querci* (Fitch) (list).
Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911. *S. querci* (Fitch) (list).
Davis, Ent. News, vol. 22, p. 241, 1911. *Phyllaphis querci* (Fitch) (biblig.)
Davidson, Jour. Econ. Ent., vol. 7, p. 127, 1914. *P. querci* (Fitch) (note).
Gillette, Ent. News, vol. 25, p. 274, 1914. *Phyllaphis* sp. (list).
Baker, Ent. News, vol. 27, p. 362, 1916. *P. quercicola* n.n. for *P. querci* (Fitch) of Davis.

Records.—*Quercus agrifolia*; Placer, Contra Costa, Santa Clara counties (Davidson, Clarke); Stanford University, April, 1915; Berkeley, September, 1915; Wynola, San Diego County, June, 1916; Charter Oak, Los Angeles County, November, 1916. *Quercus lobata*, Stanford University (Davidson); *Q. wislizenii*, Placer County (Davidson); *Q. dumosa*, San Diego, August, 1915; *Quercus* sp., Spreckels, Monterey County, 1913 (Gillette).

This is a very common species of woolly aphid on the oaks, particularly the live oak, through southern and central California. According to Davidson (1914) the stem mothers occur in pseudogalls on the edges of the leaves. The second generation lice, when mature, leave these galls to live on the upper and lower surfaces of the leaves, unprotected except for their woolly covering. The sexes, apterous oviparous females and alate males, occur late in the fall. The viviparous generations are all apterous. The writer has observed the stem mothers as late as August in San Diego County, while he has found the viviparous females on the under side of the leaves as early as mid-June in Berkeley.

The identity of this species has never been definitely established. It was thought to be the species described by Fitch (Rept. Ins. N. Y., vol. 5, p. 804, 1859) as *Eriosoma querci*, but in 1916 Baker pointed out the identity of *Eriosoma querci* Fitch, proving it to be identical with a species of *Anoecia* found on *Cornus* and formerly considered to be *A. corni* Fab. Baker's decision is that the *Quercus-Cornus* species of the eastern United States is *Anoecia querci* (Fitch) and

is distinct from our western one. In 1911 Davis described a species of woolly aphis from oak under the name of *Phyllaphis querci* (Fitch) stating that it is the same one as listed by Davidson. Baker proposes the name *Phyllaphis quercicola* for this species described by Davis. Consequently it is so listed in this paper. This species is not a typical *Phyllaphis*, but it fits that genus better than any other so is placed there provisionally. The figures (14-20) are from a specimen of alate male in the Davidson collection in Stanford University.

Tribe **Callipterini** Wilson

Wilson, Can. Ent., vol. 42, p. 253, 1910.

The genera included in this tribe differ somewhat as considered by various entomologists. Since Wilson has worked out the synonymy of the various genera very well he is followed in preference to some of the European authors, although there are some points in which he is mistaken. For instance, he places *Pterocallis* Passerini, *Callipteroides* Mordwilko, *Tuberculatus* Mordwilko, *Subcallipterus* Mordwilko, and *Therioaphis* Walker as synonyms of *Myzocallis* Passerini. In regard to this, he states, "In 1894 Mordwilko used *A. coryli* Goetze as the type of his genus *Callipteroides*, but as this species..." He is mistaken in this, for in the paper referred to, Mordwilko used *A. coryli* Goetze as the type of the genus *Myzocallis* Passerini, and in 1908 he gave as the type of *Callipteroides*, *Callipterus nigritarsus* Heyden (*betulae* Koch). If *nigritarsus* Heyden is a synonym of *betulae* Koch, as Mordwilko indicates, then *Callipteroides* is a synonym of *Euceraphis* Walker, for *C. betulae* Koch certainly falls into this genus, as described by Wilson himself. The key to the California genera below is adapted from Wilson's key (Can. Ent., vol. 42, pp. 253-254, 1910).

KEY TO CALIFORNIA GENERA OF CALLIPTERINI

1. Antennal tubercles prominent (fig. 21); antennae always exceedingly long.... 2
- Antennal tubercles wanting or very small (fig. 22); antennae variable, sometimes shorter than the body..... 3
2. Cornicles very long and large (figs. 23-24)..... 4
- Cornicles very short and more or less constricted in the middle..... 5
- Cornicles little more than pores (fig. 25). Wings held horizontal at rest.

Monellia Oestlund
3. Cornicles distinct, usually being longer than broad in the middle (fig. 26) 6
- Cornicles little more than pores, and broader than long (fig. 25). Wings held horizontal at rest.....**Monellia** Oestlund

4. Cornicles one-fourth the length of the body or more, swollen in the middle (fig. 24) **Drepanosiphum** Koch
- Cornicles large and nearly one-fourth the length of the body, swollen at the base and tapering toward the middle (fig. 23) **Drepanaphis** Del Guercio
5. Inner side of antennal tubercles about one-half the length of the inner side of the first antennal joint (fig. 29) **Euceraphis** Walker
- Inner side of antennal tubercles more than one-half the length of the inner side of the first antennal segment (figs. 27-28) **Calaphis** Walsh
6. Antennae longer than body, except in *Callipterinella*, with VI spur not much shorter than VI base (fig. 31) 7
- Antennae shorter than the body, with VI spur very short, often being little more than a nail-like process (fig. 34) 9
7. VI spur considerably longer than VI base, being one and one-half to two times as long. Anal plate emarginate but not deeply bilobed.
Callipterinella Van der Goot
- VI spur about equal to or shorter than VI base. Anal plate deeply bilobed 8
8. VI spur and VI base subequal (fig. 31). Cornicles twice as long as broad in the middle and constricted in the middle (figs. 26, 32).
Myzocallis Passerini
- VI spur shorter than VI base (fig. 30). Cornicles much broadened at base (fig. 33) **Eucallipterus** Schouteden
9. VI spur less than one-half the length of VI base (fig. 34). Cornicles not longer than broad at the base, and constricted in the middle (fig. 35).
Chromaphis Walker
- VI spur at least one-half as long as VI base (figs. 63, 66). Cornicles short, about as long as broad and placed on a broad base **Callipterus** Koch

2. Genus **Drepanosiphum** Koch

Koch, Die Pflanzenläuse, p. 201, 1855. Type *Aphis palantanoides* Schrank.

4. **Drepanosiphum** *platanoides* (Schrank)

Figures 21, 24, 36

Schrank, Fauna Boic., vol. 2, p. 1206, 1801. *Aphis* (orig. desc.).

Wilson, Jour. Econ. Ent., vol. 2, p. 349, 1909 (desc. ala. vivi., ala. ovi. females).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 759, 1912 (list).

Records.—*Acer macrophyllum*, *A. negundo*; Berkeley, 1915 (Essig); Stanford University, October, 1914, April, 1915; *A. pseudoplatanus*, Stanford University, November, 1914 (Morrison); *A. saccharum*, Berkeley, June, 1915; *Platanus racemosus*, Stanford University (Davidson); *Acer* sp., San Lorenzo, 1908 (Wilson).

This is a very common species in the San Francisco Bay region on various species of maples, and on box elder and western sycamore. In April the alate and apterous viviparous females are abundant, remaining so throughout the summer and early fall. In the later fall (October and November) the sexes appear. Just where the eggs

are laid the author is unable to say. A curious fact is that the oviparous females are alate as well as apterous. The author has never seen the alate forms, but Wilson (1908) describes them.

3. Genus **Drepanaphis** Del Guercio

Del Guercio, Rivista di patologia vegetale, vol. 4, pp. 49-53, 1909. Type *Siphonophora acerifolii* Thomas.

5. **Drepanaphis acerifolii** (Thomas)

Figures 23, 37

Thomas, Illinois Lab. Nat. Hist., Bull. 2, p. 4, 1878. *Siphonophora* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 249, 1903. *Drepanosiphum* (list).

Sanborn, Kan. Univ. Sci., Bull. 3, p. 45, 1904. *Drepanosiphum* (desc. ala.).

Davidson, Jour. Econ. Ent., vol. 2, p. 303, 1909. *Drepanosiphum* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910. *Macrosiphum* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 760, 1912 (list).

Essig, Mon. Bull., Cal. Comm. Hort., vol. 3, p. 85, 1914 (list).

Essig, Mon. Bull., Cal. Comm. Hort., vol. 3, p. 445, 1914 (list).

Records.—*Acer* sp.: Stanford University (Davidson); Sacramento (Essig); Hanford, Fresno County (B. V. Sharp); *A. macrophyllum*, *A. saccharinum*, Berkeley, July to October, 1915; Riverside, October, 1916; *A. dasycarpum*, *A. platanooides*, Berkeley, 1915 (Essig); *Quercus* sp. (live oak), Berkeley (Clarke) (?).

This is as common a species on maple in the San Francisco Bay region as the preceding one. It has also been taken in the Sacramento and the San Joaquin valleys, and in southern California. It is a species easily recognized by its dark markings and the dorsal tubercles on the first and second abdominal segments.

4. Genus **Calaphis** Walsh

Figure 28

Walsh, Proc. Ent. Soc. Phila., vol. 1, p. 301, 1863. Type *C. betulella* n.sp.

6. **Calaphis betulaecolens** (Fitch)

Figures 27-38

Fitch, Cat. Homop. N. Y., p. 66, 1851. *Aphis* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 249, 1903. *Callipterus* (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 301, 1909. *Callipterus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Callipterus* (list).

Essig, Pom. Jour. Ent., vol. 3, p. 556, 1911 (syn.).

Davidson, Jour. Econ. Ent., vol. 5, p. 404, 1912 (desc. sexes).

Essig, Pom. Jour. Ent., vol. 4, p. 760, 1912 (list).

Essig, Mon. Bull., Cal. Comm. Hort., vol. 3, p. 445, 1914 (list).

Baker, Proc. Ent. Soc., Washington, vol. 18, p. 186, 1916 (desc.).

Records.—*Betula* sp., Alameda, Contra Costa, Santa Clara counties (Clarke, Davidson, Essig, Morrison, and the author).

This is a common species of aphid on birch (*Betula* spp.) in the San Francisco Bay region. In the early part of March the eggs begin to hatch. In 1915 at Stanford University eggs began to hatch on March 8, the process continuing for several days. A month later both alate and apterous females were quite abundant; the alate females being undoubtedly the stem mothers, the apterae belonging to the second generation. Viviparous generations appeared throughout the summer. During August the sexes, alate males and apterous oviparous females, occurred. In 1914 the sexes and sexupara were noticed on August 28. Egg laying occurred shortly afterward, the eggs being laid in the crotches of the twigs and under the curled edges of the bark. Birch is the only recorded host plant.

5. Genus **Euceraphis** Walker

Walker, The Zoologist, p. 2001, 1870. Type *Aphis betulae* Koch.

KEY TO CALIFORNIA SPECIES

1. Body light green; third joint of antennae with about 13-18 sensoria on basal one-half (fig. 39) **gillettei** Dvsn.
- Body yellow with dark markings on head and thorax, and often with as many as eight black transverse stripes on the abdomen (the number varies between none and eight); third antennal segment with 19-25 sensoria (fig. 40) **betulae** (Koch)

7. **Euceraphis betulae** (Koch)

Figures 29, 40

Koch, Die Pflanzenläuse, p. 217, 1855. *Callipterus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 405, 1913 (desc. ovi. female).

Davidson, Jour. Econ. Ent., vol. 7, p. 129, 1914 (desc. stem mother).

Records.—*Betula* sp.: Oakland (Davidson); Palo Alto, March to April, 1915.

Davidson lists this species, describing the stem mother and oviparous female from the San Francisco Bay region. The author found it in Palo Alto during March and April, 1915, on *Betula alba*. According to Davidson the stem mothers hatch from the eggs about the middle of February, feeding on the stems until the leaves open in March. The viviparous generations occur during the summer. He took the oviparous females in November. His description of the stem mother gives three dusky transverse bands on the abdomen. The author has found this to be variable, the number ranging from none to eight.

8. **Euceraphis gillettei** Davidson

Figure 39

- Clarke, Can. Ent., vol. 35, p. 248, 1903. *Lachnus alnifoliae* Fitch (list).
 Davidson, Jour. Econ. Ent., vol. 2, p. 300, 1909. *L. alnifoliae* Fitch (list).
 Davidson, Jour. Econ. Ent., vol. 3, p. 375, 1910. *L. alnifoliae* Fitch (list).
 Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912. *Lachnus alnifoliae* Fitch (list).
 Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912. *Lachnus alnifoliae* Fitch (note).
 Davidson, Jour. Econ. Ent., vol. 8, p. 421, 1915 (orig. desc.).

Records.—*Alnus rhombifolia*; Berkeley (Clarke), Stanford University, San Jose, Walnut Creek (Davidson), Stanford University, March, 1915.

This species was reported from alder by Clarke and Davidson as *Lachnus alnifoliae* Fitch. Essig, in his Host plant list of California Aphididae, lists *Callipterus alnifoliae* (Fitch) on *Alnus rhombifolia*, but later states that this citation should be *Lachnus alnifoliae* Fitch. Therefore he referred to this new species of Davidson. The author took both apterous and alate viviparous females of this species on *Alnus rhombifolia*, along the banks of the San Francisquito Creek, near Stanford University, on March 19, 1915. During the spring it was quite common there.

6. Genus **Eucallipterus** Schouteden

Schouteden, Mem. Soc. Ent. Belg., vol. 12, 1906. Type *Aphis tiliae* Linn.

KEY TO CALIFORNIA SPECIES

1. Wings hyaline; III pale except at the apex, with 5-7 sensoria on the basal one-fifth (fig. 41) **flava** (Dvdn.)
2. Wings with veins clouded; III with apical one-fifth and basal one-half dusky, and with about 13-15 sensoria on the basal one-half (fig. 42).
tiliae (Linn.)

9. **Eucallipterus flava** (Davidson)

Figure 41

- Davidson, Jour. Econ. Ent., vol. 5, p. 406, 1912. *Euceraphis* (orig. desc.).
 Davidson, Jour. Econ. Ent., vol. 8, p. 423, 1915 (desc. sexes).

Records.—*Alnus rhombifolia*; San Jose, Walnut Creek (Davidson), Stanford University (Morrison).

This is an uncommon species in the San Francisco Bay region on *Alnus rhombifolia*, occurring on the under side of the leaves. The author has never collected it, but has specimens from Davidson, taken

in April, 1913, near Walnut Creek, Contra Costa County. According to Davidson the sexes appear in October, egg laying occurring during the first part of November. The eggs are laid at the axils of the new buds and on the twigs or canes. These hatch the following spring, the stem mothers being found in the early part of April.

10. *Eucallipterus tiliae* (Linn.)

Figures 7, 30, 33, 42, 50

Linnaeus, Syst. Nat., vol. 2, p. 734, 1735. *Aphis* (orig. desc.).

Davis, Ann. Ent. Soc. Amer., vol. 2, p. 33, 1909. *Callipterus* (desc., biblio.).

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909. *Callipterus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910. *Callipterus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Callipterus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 763, 1912 (list).

Records.—*Tilia americana*, *Tilia europea*; Stanford University (Davidson), Berkeley, August, 1914 (Essig); Stanford University, April to May, 1915; Berkeley, June, 1915.

In the San Francisco Bay region this very pretty aphid is quite common on basswood or linden. The author has taken it throughout April, May, and June. Essig found it abundantly in August. It is very easily recognized when found at rest on the under side of the leaves of its host by the two black lines extending from the front of the head along the margins of the thorax and joining with the costal margins of the wings. It so appears that these lines are continuous from the front to the tip of the wings.

7. Genus *Myzocallis* Passerini

Passerini, Gli Afidi, p. 28, 1860. Type *Aphis coryli* Goetze.

KEY TO CALIFORNIA SPECIES

1. Wings hyaline 6
- Wings not hyaline, with portions shaded (fig. 262) 2
2. Costal cell of wings hyaline (figs. 266, 267) 3
- Costal cell of forewings dusky or shaded (figs. 263, 264) 5
3. First discoidal vein dusky, otherwise the wing is hyaline. VI with spur shorter than base. Apical one-half of III dusky (fig. 47). Cornicles pale. Found on *Alnus* spp. *alnifoliae* (Fitch)
- Wings not as above (figs. 266, 267). VI with spur either equal to or longer than base. III with less than apical one-half dusky 4
4. Cornicles pale. Abdomen without dusky dorsal markings. On *Quercus* spp. *maureri* Swain
- Cornicles dusky (fig. 62). Abdomen with dusky dorsal markings. On *Castanea* spp. and *Quercus* spp. *davidsoni* Swain

5. Cornicles pale. Wings with greater portion cloudy (fig. 262). Antennae with only tips of III to VI dusky. On *Quercus* spp. **discolor** (Monell)
- Cornicles pale with apex dusky. Wings with dusky band along costal margin (fig. 263). Antennae with tips of III and IV, apical one-half of V, and all of VI and spur dusky. On *Quercus* spp. **bellus** (Walsh)
6. Abdomen with four spine-like tubercles on the dorsum of the first segment. VI with base and spur subequal, III being considerably longer than both. Cornicles pale, small, and inconspicuous. On *Ulmus* spp. **ulmifolii** (Monell)
- Abdomen without tubercles as above 7
7. III shorter than VI (base and spur). On *Quercus* spp. **punctatus** (Monell)
- III not shorter than VI (base and spur) 8
8. VI with spur about twice as long as base (fig. 44). Cornicles pale. On *Corylus* spp. **coryli** (Goetze)
- VI with spur at most only slightly longer than base 9
9. III with apex only dusky (figs. 57, 58). Cauda pale 10
- III dusky throughout (fig. 268) or with apex and a band near the base dusky (fig. 48). Cauda dusky 11
10. Cornicles pale. Antennae longer than body. Sensoria on III (two or three in number) small and located close to the base of the segment (fig. 57). On *Pasania* spp. **pasaniae** Dvln.
- Cornicles dusky, at least apical one-half. Antennae not longer than the body. Sensoria on III (five or more in number) fairly large and on basal two-thirds of segment (fig. 58). On *Quercus* spp. **quercus** (Kalt.)
11. Abdomen with dusky dorsal markings. III dusky throughout (fig. 268). On *Arundo* spp. **arundinariae** Essig
- Abdomen without dusky dorsal markings. III with apex and band near base dusky (fig. 48). On *Arundo* spp. **arundicolens** (Clarke)

11. *Myzocallis alnifoliae* (Fitch)

Figure 47

Fitch, Cat. Homop. N. Y., p. 67, 1851. *Lachnus* (orig. desc.).

Essig, Pom. Jour. Ent., vol. 4, p. 764 (762), 1912. *M. alni* (Fabr.) (desc. viviparae).

Baker, Jour. Econ. Ent., vol. 10, p. 421, 1917 (note).

Records.—*Alnus rhombifolia*; Santa Paula (Essig).

Only once has this species been taken in California, by Essig in August, 1911, near Santa Paula, Ventura County. At that time it was very abundant on the under side of the leaves, causing a large amount of sooty mold.

12. *Myzocallis arundicolens* (Clarke)

Figures 22, 48, 51, 52

Clarke, Can. Ent., vol. 35, p. 249, 1903. *Callipterus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 301, 1909. *Callipterus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Callipterus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 762, 1912 (list, in part).

Essig, Univ. Calif. Publ. Entom., vol. 1, p. 305, 1917 (desc.).

Records.—Bamboo, Berkeley (Clarke, Essig); *Arundinaria japonica*, Berkeley, June, 1915.

In the San Francisco Bay region and in the Sacramento Valley this species is often found infesting the upper and lower surfaces of the leaves of various bamboos, particularly species of *Arundinaria*, *Bambusa*, and *Phyllostachys*, and the giant reed (*Arundo donax*). Reports list it from Alameda, Sacramento, San Francisco, and Santa Clara counties. The species described by Davidson (1914) as *Eucalpterus arundicolens* (Clarke) and reported from southern California by Essig (1912) proves to be distinct, and was described by Essig (1917) as *M. arundinariae*. The following brief description is from a collection made by the author on June 9, 1915, from *Arundinaria japonica* on the campus of the University of California in Berkeley.

Alate viviparous female.—(Second generation?) Prevailing color, pale yellow. Head twice as wide as long, pale yellow, with prominent red eyes. Antennal tubercles absent. Antennae longer than body; formula III, IV, V, VI spur, VI base, I, II. Segments all pale except the margins of I and II, the apices of III, IV, V, and a band about one-sixth the length of III a short distance from the base of III (fig. 48), which are black, and VI which is slightly dusky. There are five or six transverse secondary sensoria on III, located in the dark band. The usual primary sensoria are present on V and VI, and the usual accessor sensoria on VI. Beak pale and short, reaching only to the middle of the first coxae. Thorax and abdomen normal, pale yellow, without tubercles or dusky markings. Cornicles (fig. 51) pale, short, broader at base than at apex. Cauda short, constricted in the middle, with distal end black. Anal plate (fig. 52) pale, deeply bilobed. Wings normal, hyaline, with the first and second discoidal veins and the base of the stigmal vein darker than the others. There is a perceptible shading at the tip of each vein.

Measurements: Body length 1.326 to 2.023 mm. (av. 1.644 mm.), width of thorax 0.51 to 0.68 mm. (av. 0.612 mm.), antennae total 2.839 to 3.077 mm. (av. 2.9299 mm.), III 0.8925 to 0.986 mm. (av. 0.9324 mm.), IV 0.578 to 0.663 mm. (av. 0.6423 mm.), V 0.527 to 0.561 mm. (av. 0.5403 mm.), VI base 0.306 to 0.323 mm. (av. 0.3103 mm.), VI spur 0.34 to 0.425 mm. (av. 0.3691 mm.), cornicle 0.595 to 0.765 mm. (av. 0.7002 mm.), cauda 0.153 mm., wing length 2.25 to 3.96 mm. (av. 2.9097 mm.), width 1.02 to 1.122 mm. (av. 1.071 mm.), expansion 6.341 to 6.97 mm. (av. 6.6555 mm.).

13. *Myzocallis arundinariae* Essig

Figure 268

Essig, Pom. Jour. Ent., vol. 4, p. 762, 1912. *M. arundicolens* (Clarke) (in part).

Davidson, Jour. Econ. Ent., vol. 7, p. 129, 1914. *Eucallipterus arundicolens* (Clarke) (desc. viviparae).

Essig, Univ. Calif. Publ. Entom., vol. 1, pp. 302-305, 1917 (orig. desc.).

Records.—*Arundo* sp., San Francisco Bay region (Davidson); *Arundinaria japonica*, Santa Barbara (Essig); Riverside, January to May, 1917; *Arundo donax*, San Diego, April to June, 1916.

This is the commonest bamboo-infesting species in southern California and parts of central California. For some time it was considered as *M. arundicolens* (Clarke) but this past year Essig pointed out the differences, describing it as a new species.

14. *Myzocallis bellus* (Walsh)

Figures 45, 46

Walsh, Proc. Ent. Soc. Phila., vol. 1, p. 299, 1862. *Aphis* (orig. desc.).

Essig, Pom. Jour. Ent. Zool., vol. 7, pp. 195-200, 1915. *Callipterus* (desc.).

Records.—*Quercus agrifolia*, Alhambra, Los Angeles County (Essig); Ventura (Essig).

Two collections have been made of this species in California, both in southern California, in January, 1912, in Alhambra, and in May, 1913, in Ventura. Both of these consisted only of the alate females (stem mothers), and were described by Essig.

15. *Myzocallis davidsoni* Swain

Figures 60, 61, 62, 267

Clarke, Can. Ent., vol. 35, p. 249, 1903. *Callipterus castaneae* Fitch (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Callipterus castaneae* (Buckton) (list).

Davidson, Jour. Econ. Ent., vol. 5, p. 405, 1912. *Calaphis castaneae* (Buckton) (desc. sexuales).

Essig, Pom. Jour. Ent., vol. 4, p. 760, 1912. *Calaphis castaneae* (Fitch) (list).

Swain, Trans. Am. Ent. Soc., vol. 44, p. 1, 1918 (orig. desc.).

Records.—*Castanea* sp., Berkeley (Clarke, Essig, Swain), Stanford University (Davidson, Swain), San Jose (Davidson); *Quercus pedunculata*, Berkeley (Swain, Essig).

This species was first reported in California by Clarke as *Callipterus castaneae* Fitch and later by Davidson as *Callipterus castaneae*.

Buckton. Recently the author described the species from specimens taken in Berkeley on chestnut and oak. It cannot be the *Callipterus castaneae* of Fitch, because the latter is really a *Calaphis*. It may be the same species that Buckton had when describing his *Callipterus castaneae*, in which case his name would be dropped as Fitch's species has priority, and is replaced by the author's name, *M. davidsoni*. It is more or less common throughout the San Francisco Bay region on chestnuts, and in one case on two specimens of *Quercus pedunculata* in Berkeley. The stem mothers appear during the late spring, in April and May. Viviparous generations are produced throughout the summer, the sexuales occurring in October and November.

16. *Myzocallis coryli* (Goetze)

Figures 43, 44, 53, 54

Goetze, Ent. Beiträge, vol. 2, p. 311, 1778. *Aphis* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 249, 1903. *Callipterus* (list).

Davis, Jour. Econ. Ent., vol. 3, p. 417, 1910. *Callipterus* (desc.).

Essig, Pom. Jour. Ent., vol. 4, p. 762, 1912 (list).

Records.—*Corylus* sp., Berkeley (Clarke); *Corylus rostrata*, San Francisco Bay region (Davidson); *C. rostrata* var. *californica*, *C. maxima*, Berkeley, August, 1914, June to July, 1915.

In the San Francisco Bay region this species is quite common on alder. During the seasons of 1914 and 1915 the author observed it to be very abundant on species of alder on the University of California campus. He has never found it in the south, however.

17. *Myzocallis discolor* (Monell)

Figures 262, 263

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 30, 1879. *Callipterus* (orig. desc.).

Williams, Univ. Neb. Studies, vol. 10, p. 115, 1910. *Callipterus* (desc.).

Record.—*Quercus macrocarpa*, Sacramento, October, 1916 (Davidson).

The author received specimens of this species from Davidson, which were found in October, 1916, on *Quercus macrocarpa* in Sacramento. The determination was made by Davis. Below are a few descriptive notes to supplement Williams' description listed above.

Alate viviparous female.—Antennae about as long as body, III the longest segment, followed by IV, VI, and V. VI spur is slightly longer than the base. The antennae are rather slender as compared

with other species of this genus. Primary sensoria are present on V and VI as usual, and accessory sensoria on VI. There are about seven secondary sensoria on III (fig. 262), which are more or less oval to circular, and located on the basal two-thirds of the segment. The cornicles, cauda, and anal plate are typical of the genus.

Measurements: Body length 1.28 to 1.37 mm., antenna total 1.41 mm., III 0.459 mm., IV 0.306 mm., V 0.264 mm., VI 0.289 mm. (base 0.119 mm., spur 0.17 mm.), cornicles 0.68 mm., wing length 2.074 to 2.414 mm., width 0.68 to 0.833 mm. The two dusky transverse bands across the fore wings (fig. 263) constitute the most distinguishing character. The branching of the third discoidal is quite variable.

18. *Myzocallis punctatus* (Monell)

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 31, 1879. *Callipterus* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 249, 1903. *Callipterus hyalinus* Monell (list).

Essig, Pom. Jour. Ent., vol. 4, p. 762, 1912. *M. hyalinus* (Monell) (list).

Record.—*Quercus imbricata*, Berkeley (Clarke).

This is a doubtful species, reported only by Clarke from *Quercus imbricata* in Berkeley. It is the author's opinion that this is the same species listed by Davidson as *M. quercus* (Kalt.).

19. *Myzocallis maureri* Swain

Figures 55, 56, 266

Swain, Trans. Am. Ent. Soc., vol. 44, p. 4, 1918 (orig. desc.).

Records.—*Quercus agrifolia*, Berkeley (Swain); *Quercus kelloggii*, Julian, San Diego County (Swain).

This species has been taken in Berkeley and in the Cuyamaca Mountains of San Diego County by the author. Essig has also taken it in Berkeley. It is never abundant, but the author has observed it several times and in several places in the localities mentioned.

20. *Myzocallis pasaniae* Dvdn.

Figure 57

Davidson, Jour. Econ. Ent., vol. 8, p. 424, 1915 (orig. desc.).

Records.—*Pasania densiflora*, Stevens Creek Canyon, Santa Clara County (Davidson), Berkeley, February, 1915 (Essig).

This is a species found occasionally on tanbark oak in the San Francisco Bay region. The author has never taken it but has specimens from Davidson and Essig.

21. *Myzocallis quercus* (Kalt.)

Figures 31, 32, 58

Kaltenbach, Monog. d. Pflanzenläuse, p. 98, 1843. *Aphis* (orig. desc.).Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909. *Callipterus* (list).Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Callipterus* (list).Davidson, Pom. Jour. Ent., vol. 3, p. 399, 1911. *Callipterus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 762, 1912 (list).

Davidson, Jour. Econ. Ent., vol. 7, p. 130, 1914 (desc.).

Records.—*Quercus agrifolia*; Stanford University, San Jose, Penryn, Placer County (Davidson); *Q. lobata*, Santa Clara County (Davidson); Berkeley, 1915 (Essig); *Q. pedunculata*, Berkeley, August, 1914; *Q. douglasii*, Stanford University, November, 1910, April, 1911 (Morrison); *Q. robur*, Oakland (Davidson).

This is a variable species more or less common in the San Francisco Bay region and in the Sacramento Valley on various species of oaks. When he first reported it Davidson was doubtful of its identity. Later, however, it was identified by Peter Van der Goot⁵ as this species.

22. *Myzocallis ulmifolii* (Monell)

Figure 59

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 29, 1879. *Callipterus* (orig. desc.).Davidson, Jour. Econ. Ent., vol. 2, p. 301, 1909. *Callipterus* (list).Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Callipterus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 762, 1912 (list).

Records.—*Ulmus* sp., Stanford University (Davidson), *Ulmus americana*, Walnut Creek, October, 1913 (Davidson).

Davidson reports this as common on elms in the San Francisco Bay region. However, the author has never collected it. The following brief descriptive notes are from an alate viviparous female, taken in Walnut Creek by Davidson. The most distinguishing character is the presence of a pair of small but prominent tubercles on the mid-dorsum of the first and second abdominal segments. The usual primary and accessory sensoria are present on V and VI. Secondary sensoria (fig. 59) are present on the basal one-half to two-thirds of III. These are transversely linear or oval, and number about six. The cornicles are very short, being fully as broad at the apex as long. Cauda and anal plate normal. Wings normal, radial vein indistinct, first discoidal curving toward base of wing. Body length 1.836 mm., width of thorax 0.578 mm., antennae total 1.309 to 1.326 mm., III

⁵ In 1917 George Shinji (Ent. News, vol. 27, February, 1917) described three species, *M. essigii* n.sp., *M. woodworthi* n.sp., and *M. hyalinus* (Monell), all of which are undoubtedly but varieties of this species, *M. quercus* (Kalt.).

0.442 mm., IV 0.255 to 0.272 mm., V 0.221 to 0.2465 mm., VI 0.255 mm. (base 0.136 mm., spur 0.119 mm.), cornicles height 0.034 mm., diameter at apex 0.034 mm., wing length 1.581 to 1.768 mm., width 0.663 to 0.68 mm., expansion 3.825 mm.

8. Genus **Chromaphis** Walker

Walker, The Zoologist, p. 2001, 1870. Type *Lachnus juglandicola* Kalt.

23. **Chromaphis juglandicola** (Kalt.)

Figures 34, 35

Kaltenbach, Monog. d. Pflanzenläuse, p. 151, 1843. *Lachnus* (orig. desc.).

Essig, Pom. Jour. Ent., vol. 1, p. 51, 1909. *Callipterus* (desc. vivi.).

Essig, Pom. Jour. Ent., vol. 4, p. 763, 1912 (list).

Davidson, U. S. Dept. Agr., Bull. 100, pp. 2-19, 1914 (desc. all forms).

Records.—*Juglans regia*; San Francisco Bay region, southern California.

This walnut aphid is the most abundant and injurious of the species attacking walnut in California. It is more or less abundant throughout the San Francisco Bay region, while in southern California during certain seasons it is an important pest. Davidson (1914) has described all the forms and studied the life history carefully, so but little comment is necessary. In 1915 the author observed the young stem mothers on March 22 in Sunnyvale, Santa Clara County. Three weeks later the second generation was well advanced. From the first of May on, in 1916, the viviparae were abundant on walnuts throughout San Diego County, from nursery stock in San Diego to a few cultivated trees at Santa Ysabel (altitude 3000 feet). From the middle of October until well into December, 1916, the sexuales were found throughout Los Angeles and Riverside counties.

9. Genus **Callipterus** Koch

Koch, Die Pflanzenläuse, p. 208, 1855. Type *Aphis juglandis* Kalt.

The two members of this genus in California have been considered heretofore as species of *Monellia* Oestlund (genus 10), but according to Davis⁶ they can not be so considered for in *Monellia* the wings are laid flat on the abdomen when at rest. This is found only in *Monellia caryella* (Fitch). Incidentally it may be remarked that the species known by that name in California does not have that habit, so should really be placed in this genus, *Callipterus* Koch. However, as it is identical with eastern specimens, except for this habit, the author

⁶ Essig, E. O., Beneficial and Injurious Insects of California, Mon. Bull. Cal. Comm. Hort., vol. 4, p. 83, 1915.

has thought best to retain it in *Monellis*, at least for the time being.

KEY TO CALIFORNIA SPECIES

1. VI spur about equal to or slightly longer than VI base. Tibiae mostly pale.
caryae Monell
- VI spur shorter than VI base. Tibiae entirely dark. Considerably larger than preceding species**californicus** (Essig)

24. **Callipterus californicus** (Essig)

Figures 63, 64

Essig, Pom. Jour. Ent., vol. 4, p. 767, 1912. *Monellia* (orig. desc.).

Davidson, U. S. Dept. Agr., Bull. 100, p. 34, 1914. *Monellia* (list, key to walnut aphids).

Records.—*Juglans californica* (California black walnut); Santa Paula.

In 1912 Essig described this species from specimens taken near Santa Paula in July, 1911. No other definite collections are known to the writer, although Essig reports it as more or less abundant on the California black walnut throughout the southern part of the state. Davidson has not found it in the San Francisco Bay region, nor has the author ever observed it, either in the bay region or in southern California.

25. **Callipterus caryae** Monell

Figures 65, 66

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 31, 1879 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 249, 1903 (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 301, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 764, 1912. *Monellia* (list).

Davidson, U. S. Dept. Agr., Bull. 100, pp. 19-26, 1914. *Monellia* (desc. all forms).

Records.—*Juglans regia*, *J. californica*; Berkeley, Stanford University, San Jose, San Francisco Bay region.

This species is more or less common in the San Francisco Bay region on walnuts. Davidson has described all the forms and noted its life history. The author has not taken the species.

10. Genus **Monellia** Oestlund

Oestlund, Minn. Geol. Nat. Hist. Surv., Bull. 4, p. 44, 1887. Type *Aphis caryella* Fitch.

This genus, as described by Oestlund, differs from *Callipterus* particularly in the position of the wings when the insects are at rest. In *Callipterus* they are held roof-like over the body as is usual in aphids. but in *Monellia* they are laid flat on the abdomen. It includes but the one species, *M. caryella* (Fitch).

26. *Monellia caryella* (Fitch)

Figures 25, 67, 68

Fitch, Insects N. Y., vol. 1, p. 163, 1855. *Aphis* (orig. desc. apt. vivi.).Fitch, Ins. N. Y., vol. 3, p. 448, 1856. *Callipterus* (first desc. ala. vivi.).

Davidson, Jour. Econ. Ent., vol. 7, p. 132, 1914 (list).

Davidson, U. S. Dept. Agr., Bull. 100, pp. 26-34, 1914 (desc. all forms).

Records.—*Juglans californica*, *J. nigra*, *J. regia*; San Jose, Walnut Creek (Davidson); Stanford University, May to June, 1915.

A more or less common species on both the native black walnut, and the cultivated walnut in the San Francisco Bay region. This species, while very similar to the preceding species, is probably the more common of the two. The following table of differences is taken from Davidson:⁷

Form	<i>Callipterus caryae</i> Monell	<i>Monellia caryella</i> (Fitch)
Alate viviparous female	Antennal joint III very slightly thickened basally.	Antennal joint III quite noticeably thickened for its basal half.
	Sensoria on antennal joint III occupying basal half or two-thirds.	Sensoria on antennal joint III occupying basal third.
	Antennal joint VI and its spur or filament subequal, or VI less than spur.	Antennal joint VI one-third as long again as its spur or filament.
	Dusky knee spots often present.	Dusky knee spots absent.
	Four longitudinal rows of capitate spines.	Six longitudinal rows of capitate spines.
female	Smaller than viviparous female.	Larger than viviparous female.
Oviparous female	Four longitudinal rows of capitate spines.	Six longitudinal rows of capitate spines.

This species is distinct from the preceding and according to Morrison, who has examined eastern species, is structurally identical except in the matter of the wings. He writes as follows:

⁷ Davidson, W. M., Walnut aphides in California, U. S. Dept. Agr., Bull. 100, p. 28, 1914.

I made a very careful study of specimens from California, sent me by Davidson, and of specimens collected both in Indiana and New York (type locality). I was unable to find any structural differences that would definitely separate the two lots of specimens, with the exception of the position of the wings. These are laid flat when at rest in the eastern specimens, but are not so in the Californian specimens, according to Davidson. In spite of this apparent agreement, I feel that the two must be distinct.

If this is the case, that the wings are not laid flat at rest, this species must belong to the genus *Callipterus*, and therefore cannot be *Monellia caryella* (Fitch). However, the author has not had an opportunity to study this carefully, so leaves it as it is, calling this California species *Monellia caryella* (Fitch).

Because of the fact that all the species of aphids on walnut are so closely related, and so very similar in structure, a key to separate them, one from another, is given here. This key is adapted from Davidson.⁸

1. Cornicles quite evident, about as long as wide.

Chromaphis juglandicola (Kalt.)

- Cornicles barely perceptible, considerably wider than long 2

2. Tibiae of alate viviparae entirely dusky *Callipterus californicus* (Essig)

- Tibiae of alate viviparae mostly pale 3

3. VI spur longer than VI base. Oviparous females with four longitudinal rows of capitate hairs *Callipterus caryae* Monell

- VI spur shorter than VI base. Oviparous females with six longitudinal rows of capitate hairs *Monellia caryella* (Fitch)

11. Genus *Callipterinella* Van der Goot

Van der Goot, Zur Systematic der Aphiden, 1913. Type *Aphis* (*Callipterus*) *betularius* Kaltenbach.

27. *Callipterinella annulata* (Koch)

Koch, Die Pflanzenläuse, p. 1855. *Chaitophorus* (orig. desc.).

Gillette, Jour. Econ. Ent., vol. 3, p. 367, 1910, *Chaitophorus betulae* (Buckton) (list).

Davidson, Jour. Econ. Ent., vol. 10, p. 292, 1917 (desc.).

Records.—*Betula alba*; Oakland, Walnut Creek (Davidson).

This species has been reported by Davidson as infesting the leaves and shoots of the white birch in the San Francisco Bay region. It is unknown to the author.

⁸ *Ibid.*, p. 35.

Tribe **Chaitophorini** Wilson (**Lachnidea** Mordw. and
Chaitopheri Mordw.)

Wilson, Can. Ent., vol. 42, pp. 385-387, 1910.

This tribe as considered by Wilson contains the following genera: *Arctaphis*, *Chaitophorus*, *Symydobius*, *Thomasia*, and *Sipha*. The author has followed Wilson's classification, having added, however, two genera described later by Essig: viz., *Micrella* and *Fullawaya*. Essig's genus *Eichochaitophorus* is a synonym of *Arctaphis* Walker (see discussion under no. 27). Mordwilko's groups *Lachnoidea* and *Chaitophori* are both included in this one tribe. In the former, Mordwilko includes *Symydobius* and *Pterochlorus*, and in the latter, *Cladobius*, *Melanoxanthus*, and *Chaitophorus*. Both *Cladobius* and *Melanoxanthus* are included in this paper in the tribe *Pterocommini*, being synonyms of the genus *Pterocomma* Buckton. Following is a description of the tribe *Chaitophorini* as given by Wilson (*op. cit.*):

Antennae, except in *Sipha*, always six-segmented; in *Sipha* there are but five. Length variable; antennal tubercles wanting; antennae, legs, and body covered with hair-like bristles. Fore wings with two oblique veins and cubitus always twice forked; hind pair with two cross veins. Nectaries (cornicles) variable in length and size, but never longer than one-tenth the length of the body. The genera in this tribe are somewhat similar to those in the tribe *Callipterini*, but are easily distinguished by the shorter and heavier antennae and legs, as well as by the finer and more hair-like bristles.

The following key to the Californian genera has been adapted from Wilson and Essig:

1. Spur of sixth antennal segment at least three times as long as the segment 2
 - Spur not three times as long as the segment. Cauda broadly rounded and without knobbed tip 4
 - 2. Spur more than five times as long as the segment; cornicles longer than the base of the sixth segment **Chaitophorus** Koch
 - Spur of sixth segment not more than five times as long as the segment; cornicles not longer than the base of the sixth segment 3
 - 3. Cauda a knob on a quadrangular base (fig. 69). Spur about five times as long as sixth segment **Arctaphis** Walker
 - Cauda tapering to a blunt tip which is usually straight across, not being rounded or constricted at the base (fig. 70). Spur but slightly more than three times as long as the sixth segment **Micrella** Essig
 - 4. Spur of sixth segment shorter or scarcely longer than the segment; antennae nearly as long as the body **Symydobius** Mordwilko
 - Spur considerably longer than sixth segment; antennae about one-half the length of the body 5
 - 5. Cornicles absent; body with lateral tubercles **Fullawaya** Essig
 - Cornicles present; lateral body tubercles wanting **Thomasia** Wilson

Genus **Chaitophorus** Koch

Koch, Die Pflanzenläuse, p. 1, 1854. Type *Aphis aceris* Linn.

There are at present no species of this genus in California; most of the species hitherto placed in it are now considered as belonging to the genus *Thomasia* Wilson.

12. Genus **Arctaphis** Walker

Walker, The Zoologist, p. 2000, 1870. Type *aphis populi* Linn.

This genus as defined by Wilson is represented in California by two species: *A. viminalis* (Monell) and *A. populifolii* (Essig). The latter was placed by Essig in a new genus, *Eichochaitophorus*, but there is not enough difference between these to warrant a new genus.

KEY TO CALIFORNIA SPECIES

1. Wings hyaline. Three-nine large sensoria on third antennal segment (fig. 71).
IV half as long against as V **populifolii** (Essig)
- Wings subhyaline. About ten rather small sensoria on III. IV but very
little longer than V **viminalis** (Monell)

28. **Arctaphis populifolii** (Essig)

Figures 69, 71

Essig, Pom. Jour. Ent., vol. 4, p. 722, 1912. *Eichochaitophorus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 375, 1910. *Chaitophorus populifoliae* (Fitch) (desc. male).

Davidson, Pom. Jour. Ent., vol. 3, p. 399, 1911. *Chaitophorus populifoliae* (Fitch) (list).

Records.—*Populus trichocarpa*, Santa Paula (Essig), Berkeley, September, 1915; *Populus fremontii*, Stanford University and Penryn, Placer County (Davidson); Menlo Park, San Mateo County, October, 1914 (Morrison); Berkeley, September, 1915; El Cajon, San Diego County, June, 1916; Riverside, October, 1916.

In 1912 Essig described this species from specimens taken on *Populus trichocarpa* at Santa Paula, and placed it in a new genus, *Eichochaitophorus*. He separated this genus from *Arctaphis* for the following reasons:

According to Wilson the cauda [in *Arctaphis*] is a knob on a quadrangular base. The anal plate is broadly rounded. In the new genus [*Eichochaitophorus*] the style has a distinct neck and is situated on a very distinct conical base. The anal plate is deeply notched in the middle so as to make it somewhat forked as in the genus *Callipterus*.

Although the anal plate is somewhat notched, there is scarcely difference enough to warrant the forming of a new genus. In fact, in many specimens one cannot tell whether or not a notch is present. As to the cauda, consisting of the tip, a distinct neck, and a distinctly conical base, this is not greatly different from a cauda consisting of a knobbed tip on a quadrangular base. The only practical difference is in the base, being conical in one and quadrangular in the other. In *populifolii* (Essig) the base seems to be conical, yet one cannot be certain unless the specimen is mounted exactly.

This species, *A. populifolii* (Essig), as stated above, was described from specimens taken on *Populus trichocarpa* at Santa Paula. In 1910 Davidson found a species on *Populus fremonti* at Stanford University, and the following year at Penryn, Placer County, which he listed as *Chaitophorus populifoliae* (Fitch). A careful study of specimens from Davidson and the cotypes of Essig's species convinced the author that they were identical. Morrison writes that Davidson's specimens are not *C. populifoliae* (Fitch), so Essig's species is distinct. In September, 1915, the author observed a great number of specimens of this species on a weeping elm (*Ulmus* sp.) in Berkeley, which was in close proximity to some poplars. However, none were seen to be feeding on the elm, all being restless and wandering over the leaves and branches. In southern California this is often found infesting the empty galls of *Thecabius populimonilis* Riley; such having been observed in San Diego and Riverside counties.

29. *Arctaphis viminalis* (Monell) ?

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 31, 1879. *Callipterus* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 248, 1903. *Chaitophorus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 375, 1910. *Chaitophorus* (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911. *Chaitophorus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 716, 1912. *Thomasia* (list, key to Californian species of *Thomasia*).

Patch, Maine Agr. Exp. Sta., Bull. 213, p. 80, 1913. *Chaitophorus* (desc.).

Records—*Salix* spp.; Watsonville, Santa Cruz County, and Newcastle, Placer County (Clarke); Penryn, Placer County, and Stanford University (Davidson).

This species has been reported from Placer, Santa Clara, and Santa Cruz counties on various species of willow. The true *Chaitophorus viminalis* Monell is an *Arctaphis*, but whether or not the western species is the same as the eastern is a question. The author has never seen specimens of either and is therefore unable to make

any further comment. He once thought the western species was identical with *Thomasia salicicola* (Essig), to which Morrison considers it very closely related, but Davidson assures him the two are distinct.

13. Genus **Micrella** Essig

Essig, Pom. Jour. Ent., vol. 4, p. 716, 1912. Type *M. monella* n.sp.

30. **Micrella monella** Essig

Figures 70, 72

Essig, Pom. Jour. Ent., vol. 4, p. 717, 1912 (orig. desc.).

Records.—*Salix lasiolepis*, Oxnard (Essig); *S. laevigata*, Santa Paula (Essig).

This species was taken twice by Essig, who described it, in 1910 near Oxnard, and in 1911 near Santa Paula. Since then it has never again been found. The author has had access to cotype specimens in Essig's collection.

14. Genus **Fullawaya** Essig

Essig, Pom. Jour. Ent., vol. 4, p. 735, 1912. Type *F. saliciradicis* n.sp.

31. **Fullawaya saliciradicis** Essig

Figure 75

Essig, Pom. Jour. Ent., vol. 4, p. 737, 1912 (orig. desc.).

Record.—*Salix laevigata*, Santa Paula, August, 1911 (Essig).

On the roots of willow near Santa Paula, Essig once found a large number of aphids, the greater part of which were apterae, although a few alates were present. Unable to identify them with any known species, or to fit them into any genus, he described them as this species. Since then they have not been taken. The author has had access to cotype specimens in Essig's collection.

15. Genus **Thomasia** Wilson

Wilson, Can. Ent., vol. 42, p. 386, 1910. Type *Chaitophorus populicola* Thomas.

This genus is separated from *Chaitophorus* principally by the comparative lengths of the antennae and the comparative lengths of the spur of the sixth antennal segment. In *Chaitophorus* (type *Aphis aceris* Linn.) the antennae are almost as long as the body, and the spur of the sixth segment is over five times as long as the base. In this genus the antennae are but about one-half as long as the body, and VI spur is but slightly longer than VI base.

KEY TO CALIFORNIA SPECIES

- | | |
|---|----------------------------|
| 1. Wings hyaline | 2 |
| — Wings with veins clouded (fig. 275) | populicola (Thomas) |
| 2. III longer than VI (including spur) | negundinis (Thomas) |
| — III not longer than VI (including spur) | 3 |
| 3. IV with secondary sensoria | crucis Essig |
| — IV without secondary sensoria | salicicola Essig |

32. *Thomasia crucis* Essig

Figure 76

Essig, Pom. Jour. Ent., vol. 4, p. 742, 1912 (orig. desc.).

Records.—*Salix macrostachya*, Santa Paula, August, 1911 (Essig).

Essig once found this species on the leaves of willow near Santa Paula. Since then it has never again been taken. The author has had access to cotype specimens in Essig's collection.

33. *Thomasia negundinis* (Thomas)Thomas, Ill. Lab. Nat. Hist., Bull. 2, p. 10, 1878. *Chaitophorus* (orig. desc.).Sanborn, Kan. Univ. Sci., Bull. 3, p. 35, 1904. *Chaitophorus* (desc.).Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *Chaitophorus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 716, 1912 (list).

Records.—*Acer negundo*, Stanford University (Davidson); Salt Marshes, Palo Alto, May, 1912 (Morrison).

This species of *Thomasia* is quite common on box elder in the vicinity of Stanford University and Palo Alto. The author has never taken specimens, nor had access to any. Morrison writes that although he has never had access to eastern specimens of *T. negundinis* (Thos.) for comparison he is not able to convince himself that the western species is *negundinis*. The author is unable to form any opinion at present, having never seen specimens, hence lists the species as Davidson has done.

34. *Thomasia populicola* (Thomas)

Figures 77, 275

Thomas, Ill. Lab. Nat. Hist., Bull. 2, p. 10, 1878. *Chaitophorus* (orig. desc.).Essig, Pom. Jour. Ent., vol. 1, p. 98, 1909. *Chaitophorus* (desc.).

Essig, Pom. Jour. Ent., vol. 4, p. 716, 1912 (list).

Records.—*Populus* spp., *Salix* spp., Santa Paula (Essig); Riverside, May, 1917; *Populus* sp., Canton, Broadwater County, Montana, July, 1915, R. W. Haegele; Edna Cañon, Boxelder County, Utah, August, 1916, R. W. Doane.

This species has been reported by Essig from Ventura County. The author has never taken the alates, but has had the opportunity of examining Essig's specimens, and specimens from Montana and Utah taken by Haegele and Doane. It is easily distinguished from other members of the genus by the broad, dark wing veins.

35. *Thomasia salicicola* (Essig)

Figure 78

Essig, Pom. Jour. Ent., vol. 3, p. 532, 1911. *Chaitophorus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 375, 1910. *Chaitophorus nigrae* Oestlund (?) (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911. *Chaitophorus nigrae* Oestlund (?) (list).

Essig, Pom. Jour. Ent., vol. 4, p. 619, 1912 (note).

Essig, Pom. Jour. Ent., vol. 4, p. 716, 1912 (list).

Records.—*Salix laevigata*, Santa Paula (Essig), *Salix nigra*, Lakeside, San Diego County, April, 1916; *Populus trichocarpa*, Santa Paula (Essig); *Salix* sp., San Jose, Stanford University, Penryn, Placer County (Davidson), Fillmore, Ventura County, March, 1911 (Essig).

Essig reported this from Ventura County, and the author has found it in San Diego County. It was observed to be in large colonies on the leaves and leaf petioles of the tender growth of willow, in company with *Siphocoryne carpreae* (Fabr.). Specimens taken by Davidson and listed as *Chaitophorus nigrae* Oestlund prove to be identical with this species.

16. Genus *Symydobius* Mordwilko

Mordwilko, Rap. Lab. Zool. Kap. Imp. Varch. Univ., 1895. Type *Aphis oblonga* Heyden.

KEY TO CALIFORNIA SPECIES

1. Anal plate half-moon-shaped 2
- Anal plate bilobed (fig. 271); cornicles pale, appearing white in life; antennae with about six to eight secondary sensoria on III, and one or two on IV (fig. 272) *chrysolepis* Swain
2. Spur of VI but a short thumb-like projection; sensoria on III numbering about six to ten; none on IV *agrifoliae* Essig
- Spur of VI longer, being equal to or longer than base of VI; fifteen to twenty sensoria on III, one or two on IV (figs. 73, 74) 3
3. Antennae for the most part dark, being dark brown or black; spur and base of VI equal, lateral abdominal tubercles present in apterae. *macrostachyae* Essig
- Antennate for the most part pale, being light brown or amber; spur of VI usually slightly longer than base; apterae without lateral abdominal tubercles *salicorticis* Essig

36. *Symydobius agrifoliae* Essig

Essig, Univ. Calif. Publ. Entom., vol. 1, pp. 311-317, 1917 (orig. desc.).

Records.—*Quercus agrifolia*; Santa Paula (Essig).

This interesting aphid was taken in Ventura County on live oak during 1911. It differs from other members of this genus in the extremely short spur of the sixth antennal segment. The coloration is very similar to that of the next species, but the length of VI spur and the fact that the anal plate is not bilobed serves to distinguish it.

37. *Symydobius chrysolepis* Swain

Figures 269 to 274

Swain, Trans. Am. Ent. Soc., vol. 44, p. 6, 1918 (orig. desc.).

Records.—*Quercus chrysolepis*; Alpine, San Diego County (Swain).

This is a medium sized, brownish colored aphid found in 1916 infesting the terminal twigs and leaf petioles of maul oak in San Diego County. Its pale white cornicles are very conspicuous, and serve as a distinguishing character. The anal plate is bilobed, a character not found in other members of the genus, and one which may be sufficient for the separation of the species (and *S. albisiphus* Davis, in which the anal plate is also bilobed) from *Symydobius* into a new genus. However, the author believes it best to retain them in this genus at present. The apterous females were found to be heavily parasitized by the chalcid fly, *Closterocerus utahensis* Crawford var. *californicus* Girault.

38. *Symydobius macrostachyae* Essig

Figure 73

Essig, Pom. Jour. Ent., vol. 4, p. 727, 1912 (orig. desc.).

Records.—*Salix macrostachya*; Santa Paula (Essig), Fresno, June, 1915.

Twice has this species been taken, once by Essig near Santa Paula and once by the author along the San Joaquin River near Fresno. It is found in fairly large colonies on the younger stems of willow. These colonies consist for the most part of apterae, only a very few alates being present.

39. **Symydobius salicicorticis** Essig

Figure 74

Essig, Pom. Jour. Ent., vol. 4, p. 731, 1912 (orig. desc.).

Record.—*Salix laevigata*; Santa Paula (Essig).

Together with specimens of *Fullawaya saliciradicis* Essig, this was taken on willow along the Santa Clara River near Santa Paula in August, 1911. The colonies are found on the bark near the surface of the ground either just above or just below it. Essig reports that it is preyed upon quite extensively by the larvae of an undetermined species of syrphus fly. The author has had access to cotype specimens in Essig's collection.

Group **Lachnina** Passerini

Passerini, Gli Afidi, 1860.

In this group there are included two tribes, Lachnini Del Guercio and Pterocommini Wilson, following Wilson. Mordwilko places but the one tribe Lachnini in this group, including the genus *Pterocomma* Buckton in the tribe Chaitophori. However, to the author the grouping followed here seems more natural. The following key is adapted in part from Börner (*Sorauer, Pflanzenkrankheiten*, vol. 3, p. 665, 1913):

Sixth antennal segment with a short, thick (thumb-like) projection. Cornicles conical (fig. 91) or wart-like. Empodial hair short, and oftentimes indistinguishable (fig. 79) Tribe **Lachnini**
Sixth antennal segment with a slender projection (VI spur) which is about as long as the segment (VI base). Cornicles cylindrical or clavate (figs. 81, 82). Empodial hair practically as long as the claws (fig. 80). Tribe **Pterocommini**

Tribe **Pterocommini** Wilson

Wilson, Ann. Ent. Soc. Am., vol. 8, pp. 347-358, 1915.

This tribe, as considered by Wilson, contains but the one genus, *Pterocomma* Buckton. In a former paper (*Can. Ent.*, vol. 43, p. 384, 1910) he recognized two genera: the one, *Melanoxantherium* Schouteden, in which the cornicles were swollen or vasiform, and the other,

Pterocomma Buckton, in which the cornicles were cylindrical. He states in his later paper: "...after having further studied the group I am of the opinion that such a division is illogical, and if a division is necessary each species should form a different genus. It, therefore, seems more practical to confine all the species to a single genus." The characters of this tribe and genus are as follows:

Antennae with six segments and reaching near the base of the abdomen. Wings normally with venation as in *Aphis*. Nectaries [cornicles] short, but clavate. Cauda short and broadly rounded at the tip as in *Lachnini*. Entire body, antennae, and legs covered with long hairs as in *Lachnini*. As has already been pointed out by Oestlund, this group appears intermediate between the *Chaitophorini* and the *Lachnini*. Their habits and actions being in different ways similar to both.

17. Genus *Pterocomma* Buckton

Buckton, Monog. Brit. Aphides, vol. 2, p. 143, 1879. Type *P. pilosa* Buckton.

KEY TO CALIFORNIA SPECIES

1. Cornicles abruptly constricted at distal end, and without a distinct flange (fig. 81), the diameter of the opening being less than the diameter of the smallest part of the cornicle. Wing veins broad and shaded. *flocculosa* (Weed)
- Cornicles not so abruptly constricted and with a distinct flange. Wing veins normal 2
2. Cornicles about twice as long as their greatest diameter *smithiae* (Monell)
- Cornicles considerably longer than greatest diameter, and longer than hind tarsus *populifoliae* (Fitch)

40. *Pterocomma flocculosa* (Weed)

Figure 81

Weed, Insect Life, vol. 3, p. 291, 1891. *Melanoxanthus* (orig. desc.).

Wilson, Ann. Ent. Soc. Am., vol. 8, p. 350, 1915 (desc.).

Records.—*Salix* sp., Berkeley, March, 1915; 1916 (Essig).

In his paper on *Pterocomma* Wilson states that this species does not occur on the Pacific Coast. However, in March, 1915, the author found it rather abundantly on willow on the campus of the University of California in Berkeley. During the 1916 season Essig observed it to be quite common in Berkeley. The species is easily recognized in life by the white cottony flocculence covering the colonies on the bark.

41. *Pterocomma populifoliae* (Fitch)

Figures 82, 83

Fitch, Cat. Homop. N. Y., p. 66, 1851. *Aphis* (orig. desc.).Davidson, Jour. Econ. Ent., vol. 2, p. 300, 1909. *Cladobius rufulus* n.sp. (desc.).Davidson, Jour. Econ. Ent., vol. 3, p. 375, 1910. *Cladobius rufulus* Dvdn. (list).Essig, Pom. Jour. Ent., vol. 4, p. 786, 1912. *Melanoxantharium rufulum* (Dvdn.) (desc.).Wilson, Ann. Ent. Soc. Am., vol. 8, p. 353, 1915. *Pterocomma populea* (Kalt.) (desc.).

Baker, Can. Ent., vol. 48, pp. 280-282, 1916 (desc.).

Records.—*Salix* sp.; Stanford University (Davidson); Santa Paula (Essig); Walnut Creek, March, 1915 (Davidson); Grossmont, San Diego County, March, 1916; Lakeside, San Diego County, April, 1916; Stanford University, May, 1912 (Morrison); *Populus* sp.; Stanford University (Davidson); Palo Alto, March, 1915; *Populus caroliniana*, Banning, Riverside County, April, 1917.

This is a widely distributed species in California on various species of poplars and willows. Davidson first found it in 1909, describing it as a new species. In 1915 Wilson stated that it was synonymous with *P. populea* (Kalt.), but specimens sent him by the author he determined as *P. bicolor* (Oestlund). According to his paper the cornicles of *populea* (Kalt.) are about equal in length to the hind tarsi. Californian specimens have the cornicles considerably longer than the hind tarsi, but not twice as long as he states they are in *bicolor* (Oestlund). His figures of the antennae show that in *populea* VI base and spur are subequal, and in *bicolor* the spur is considerably longer than the base. The latter is true for the Californian species. His color notes of *populea* fit the Californian species very well. Baker identified *Aphis populifoliae* Fitch as a *Pterocomma* and places *rufulus* (Davidson) as a synonym. From a study of specimens taken in Santa Paula, Grossmont, Lakeside, Stanford University, and Walnut Creek, the author finds that Baker's description of *populifoliae* fits this species very well. Below are the measurements in microns of four alate specimens, together with the measurements of cornicles, antennae, and hind tarsi of one from Lakeside. (This was preserved for several months in alcohol before being mounted for study, and had shrunk considerably.)

An examination of the following table shows that in the California specimens the cornicles are always considerably longer than the hind tarsi, but never twice as long, and that the spur of six is always longer than the base, except in one case. This specimen is considerably

TABLE SHOWING MEASUREMENTS FOR *Pterocomma populifoliae* (Fitch) FROM DIFFERENT LOCALITIES IN CALIFORNIA.

	Body length	Width thorax	Antennae total	III	IV	V	Vlb	Vls	Corn- cles	Hind tarsi	Wing length	Wing expansion
Santa Paula, August, 1911	2159	850	1479	578	272	221	127	136	221	170	3519	8007*
Walnut Creek, March, 1915	2618	1020	1717	578	255	238	136	136	221	.....	3689	11220†
Stanford University, October, 1909	3230	1241	1870	561	340	340	187	238	.....	187	4930	10489
Stanford University, April, 1915	2703	1190	2006	629	357	357	221	272	340	212	4675	.....
Lakeside, April, 1916	.....	.....	2040	612	357	357	204	306	340	221	4624	.....
	.....	.....	2023	578	374	340	204	340	374	238	.....	.....
	.....	.....	2108	612	391	340	204	357	374	272	.....	.....
	.....	.....	.....	544	357	.....	.....	.....	289	221	.....	.....
	.....	.....	1853	561	340	306	187	272	306	221	.....	.....
Average	2677	1075	1842	576	337	268	182	248	304	214	4425	9905

* Male (?).

† Antenna bent.

smaller than the others and has many more secondary sensoria, being a male. From this evidence this species is the same as Baker lists as *P. populifoliae* (Fitch) and should be so considered. The author has reared a number of specimens of a species of *Aphidius* from material obtained near Stanford University in May, 1915.

42. *Pterocomma smithiae* (Monell)

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 32, 1879. *Chaitophorus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 300, 1909. *Cladobius salicti* (Harris) (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 375, 1910. *Cladobius salicti* (Harris) (list).

Essig, Pom. Jour. Ent., vol. 4, p. 786, 1912. *Melanoxantherium salicti* (Harris) (list).

Wilson, Ann. Ent. Soc. Am., vol. 8, p. 355, 1915 (desc.).

Records.—*Salix* spp., Stanford University (Davidson, Morrison).

Both Davidson and Morrison have taken this species in the vicinity of Stanford University on various species of willow. According to Wilson, with whom Morrison and Baker agree, this is *P. smithiae* (Monell), the *salicti* of Harris being synonymous. The sexuales were observed by Davidson in October, the eggs hatching in January.

Tribe **Lachnini** Del Guercio

Del Guercio, Redia, vol. 5, 1908.

This tribe is represented in California by three genera, viz., *Essigella* Del Guercio, *Tuberolachnus* Mordwilko, and *Lachnus* Burmeister, while there are six genera included in the tribe as it is here considered. Following is a brief characterization of the tribe adapted from Mordwilko:

The body and appendages are very hairy, and usually quite large. The cauda is absent, the cornicles cupola-shaped, being black or brown in color. Sometimes they are reduced to mere pores or not fully developed [*Lachnus taxifolia* Swain]. The antennae in general are not longer than the head and thorax, six-jointed [except in *Essigella* Del Guercio], with the spur of the sixth segment very short, not being as long as the segment itself. The beak is almost always elongated, generally reaching to or beyond the middle of the abdomen. All this group possess the anatomical peculiarity that the narrowed hind end of the stomach is covered with the intestine. The stigma of the fore wing is elongate linear [in *Longistigma* Wilson it reached past the tip of the wing (fig. 89)]. The cubitus is twice-branched.

All the California species with the exception of *Tuberolachnus viminalis* (Fonse.), which lives on willow, are found on conifers—*Pinus* sp., *Pseudotsuga* sp., or *Picea* sp.

Following is a key to the genera, adapted from Del Guercio, Wilson and Essig. In this key are included not only the California genera but the other three as well, in that an understanding of the characters is thus made easier.

1. Antennae six-segmented 2
- Antennae five-segmented (fig. 83) **Essigella** Del Guercio
2. Stigma exceptionally long, reaching beyond the tip of the wing (fig. 84).
..... **Longistigma** (Wilson)
- Stigma not exceptionally long, not reaching beyond the tip of the wing
(fig. 85) 3
3. First joint of the hind tarsus much shorter than half the second (fig. 86) 4
- First joint of the hind tarsus equal to or slightly longer than half the second
(fig. 87) **Eulachnus** Del Guercio
4. Abdomen with horn-like tubercle on median dorsum between the cornicles,
(Sometimes this cannot be made out in specimens mounted in balsam, but
it is always readily discernible in fresh or alcoholic material).
..... **Tuberolachnus** Mordwilko
- Abdomen without horn-like tubercle 5
5. Bases of first and second discoidal close together; third discoidal often very
faint; wings slightly if ever clouded (fig. 85) **Lachnus** Burmeister
- Bases of first and second discoidals not so close together as in *Lachnus* Burm.;
third discoidal plain; wings often darkly clouded **Pterochlorus** Rondani

18. Genus **Essigella** Del Guercio

Del Guercio, Rev. di patal. veg., vol. 3, p. 328, 1909. Type *Lachnus californicus* Essig.

43. **Essigella californica** (Essig)

Figures 3, 5, 83

Essig, Pom. Jour. Ent., vol. 1, p. 1, 1909. *Lachnus* (orig. desc.).

Del Guercio, Pom. Jour. Ent., vol. 1, p. 73, 1909 (translation by C. F. Baker of Del Guercio's paper listed above).

Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 780, 1912 (desc.).

Records.—*Pinus radiata*; Claremont, Los Angeles County, and Santa Paula (Essig); *Pinus sabiniana*, Stanford University, March, 1915; *Pinus* spp., Stanford University, March and April, 1912 (Morrison); Ontario, San Bernardino County, January, 1917.

This curious little aphid, described by Essig from specimens taken in Claremont, Los Angeles County, on *Pinus radiata*, has since been found in several parts of the state. Wilson has taken it in Oregon on *Pseudotsuga taxifolia*, and Patch in Maine on *Pinus strobus*. It

is a small, slender, long-legged aphid, that clings fast to the pine needles and is extremely difficult to see. However, if a branch of pine is struck sharply and with considerable force over a white paper or cloth, a large number of these aphids will jar off.

19. Genus **Tuberolachnus** Mordwilko

Mordwilko, Ann. Mus. Zool. d. l'Acad. Imp. Sci., vol. 13, p. 374, 1908.

Type *Aphis viminalis* Fonsc.

44. **Tuberolachnus viminalis** (Fonsc.)

Figure 86

Boyer de Fonscolombe, Ann. Ent. Soc. France, vol. 10, p. 162, 1841. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909. *Lachnus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910. *Lachnus* (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911. *Lachnus dentatus* Le Baron (list).

Essig, Pom. Jour. Ent., vol. 4, p. 774 (772), 1912 (list).

Records.—*Salix* spp., Stanford University and Penryn, Placer County (Davidson); Ventura County (Essig); Stanford University, November, 1914; Berkeley, July, 1915; Riverside, July, 1916.

This extremely large aphid, which lives in large colonies on the branches of various species of willows, is found throughout the San Francisco Bay region, Sacramento Valley, and southern California, although it is not at all common. Davidson reports considerable parasitization by a species of *Ephedrus*, and Essig infection from some bacterial or fungus disease. The large size and the presence of a dorsal abdominal tubercle are distinguishing characters.

20. Genus **Lachnus** Burmeister

Burmeister, Handbuch d. Entomologie, p. 91, 1835. Type *Lachnus faciatius*, n.sp.

This is the third largest genus of aphids in regard to the number of species in California. All the species are to be found on various conifers, usually feeding through the bark of the branches or trunk. Characters for distinguishing the species are hard to obtain, and those used by the author in the following key are of no value except with specimens of the alate viviparae. This key is not at all adequate, and is offered here merely as an aid. The author understands that Wilson is preparing a monograph of this genus, which will undoubtedly prove quite valuable.

KEY TO CALIFORNIA SPECIES

1. Beak reaching considerably beyond the third coxa 2
- Beak at most barely reaching to the third coxa 8
2. Beak reaching almost to or even beyond the tip of the abdomen 3
- Beak not reaching to the tip of the abdomen 4
3. First joint of hind tarsus more than one-third as long as the second joint.
Legs black except the base of the femora and a broad ring near the base
of the tibiae **ponderosa** Williams
- First joint of hind tarsus scarcely more than one-fourth as long as the second
joint. Legs pale at the base of the femora and tibiae, black at tips.
..... **oregonensis** Wilson
4. Body exceptionally large, being over 4 mm. long, usually about 5 mm., and
over 2 mm. wide 5
- Body of average size, being from 2.5 mm. to 3 mm. long, and from 0.75 to
1.2 mm. wide 7
5. Third segment of antennae with many sensoria (eight or more), (figs. 88,
89) 6
- Third joint of antennae with but few or no sensoria, at most with one or two.
First joint of hind tarsus a little less than half as long as the second.
On *Pinus sabiniana* **sabinianus** n.sp.
6. Third joint of antennae with about 8-12 sensoria (fig. 88). Tibiae with a pale
ring near the base. First joint of hind tarsus scarcely more than one-third
the length of the second. On *Picea* sp. **vanduzeei** n.sp.
- Third joint of the antennae with 19-20 sensoria (fig. 89). Tibiae without
pale ring near base. First joint of hind tarsus almost one-half the length
of the second. On *Pinus* sp. and *Abies* sp. **ferrisi** Swain
7. Beak not reaching to the middle of the abdomen. Segment three of the
antennae almost as long as the fourth, fifth, and sixth together. Apex
of stigma meeting the margin of the wing in an acute angle, and not
terminated by a distinct vein (fig. 92). On *Pseudotsuga taxifolia*.
..... **pseudotsugae** Wilson
- Beak reaching beyond the middle of the abdomen. Third antennal segment
not nearly so long as the fourth, fifth, and sixth together. Apex of stigma
meeting the wing margin in an obtuse angle, and terminated by a distinct
vein (fig. 93). Apterous viviparous females with a distinctive pattern on
dorsum of abdomen. On *Thuja occidentalis* **tujafilinus** (Del Guercio)
8. First joint of hind tarsus longer than one-fourth the second 10
- First joint of hind tarsus less than one-fourth the second 9
9. Third antennal segment without sensoria (fig. 94). Body robust, being of the
usual *Lachnus* shape. Third discoidal twice-branched, only occasionally
once-branched. On *Abies grandis* **occidentalis** Davidson
- Third antennal segment with several irregular sensoria (fig. 95). Body long
and narrow, being somewhat the shape of *Essigella californica* (Essig).
Third discoidal simple or once-branched. On *Pinus* sp.
..... **pini-radiatae** Davidson
10. Cornicles very poorly developed, seemingly absent in some cases (fig. 103).
Segment three of antennae with five-seven large circular sensoria which are
hardly distinguishable (fig. 106). On *Pseudotsuga taxifolia*.
..... **taxifolia** Swain
- Cornicles normal (fig. 97), being quite conspicuous. Third antennal segment
with two-four clearly defined sensoria (fig. 101). On *Picea glehni*.
..... **glehnus** Essig

45. Lachnus ferrisi Swain

Figures 89, 91

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909. *Lachnus abietis* Fitch (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910. *Lachnus abietis* Fitch (list).

Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912. *Lachnus abietis* Fitch (list).

Swain, Trans. Am. Ent. Soc., vol. 44, p. 9, 1918.

Records.—*Abies concolor*, Stanford University (Davidson); *Pinus* sp., Stanford University (Swain).

This large lachnid, recently described by the author, has been found only in the vicinity of Stanford University, in 1909 and 1910 by Davidson on lowland fir, and in 1915 by Ferris on some young pine trees. Since then it has not been observed.

46. Lachnus glehnus Essig

Figures 96, 97

Essig, Pom. Jour. Ent. Zool., vol. 7, pp. 180-187, 1915 (orig. desc.).

Record.—*Picea glehni*, Sacramento (Essig).

Essig described this species from specimens taken on a Japanese spruce in Capitol Park, Sacramento, in 1912. At the time it was so abundant that control measures were deemed necessary. The author has had access to the type specimens in Essig's collection.

47. Lachnus occidentalis Davidson

Davidson, Jour. Econ. Ent., vol. 2, p. 300, 1909 (orig. desc. apterae).

Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912 (list).

Wilson, Can. Ent., vol. 44, p. 193, 1912 (desc. all forms).

Records.—*Abies grandis*, Stanford University (Davidson, Morrison, Ferris and the author); *Abies concolor*, Corvallis, Oregon (Wilson).

This species is practically always present on a lowland fir tree in the cactus garden of the Stanford University grounds. Wilson has found it in the vicinity of Corvallis, Oregon, on white fir. Davidson states that it is heavily preyed upon by the larvae of *Syrphus arcuatus* and *Syrphus opinator*.

48. *Lachnus oregonensis* Wilson

Wilson, Trans. Am. Ent. Soc., vol. 12, p. 103, 1915 (orig. desc.).

Record.—*Pinus contorta*, Oregon and California (Wilson).

There has been no published record of this species from California. Wilson wrote the author some time ago that he had taken it in this state, although he gave no definite locality. The author has never seen specimens.

49. *Lachnus pini-radiatae* Davidson

Figure 95

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910 (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 785, 1912 (descriptive note).

Records.—*Pinus radiata*, Stanford University (Davidson), August, 1914, April, 1915 (author), March, 1916 (K. B. Brown); *Pinus ponderosa*, Bowman, Placer County, November, 1911 (H. H. Bowman), Berkeley, March, 1915 (Geo. Shinji); *Pinus sabiniana*, Penryn, Placer County (Davidson).

This is a fairly small, slender-bodied, long-legged lachnid found infesting the needles of various pines in the San Francisco Bay region and in the Sacramento Valley. They are easily recognized on the needles by the whitish mass of flocculence which covers their bodies.

50. *Lachnus ponderosa* Williams

Figure 104

Williams, Univ. Neb. Studies, vol. 10, p. 106, 1910 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 127, 1914 (list).

Record.—*Pinus ponderosa jeffreyi*, Tallae, Eldorado County (Davidson).

Davidson's is the only report of this species in California. The identification of his specimens was verified by Davis. One specimen the author saw was quite small, being much smaller than the others taken by Davidson.

51. *Lachnus pseudotsugae* Wilson

Figures 92, 98

Wilson, Can. Ent., vol. 44, pp. 159, 302, 1912 (orig. desc.).

Record.—*Pseudotsuga taxifolia*; Oregon, California (Wilson).

Wilson wrote the author some time ago that he had taken this species in California, although he gave no definite locality or collection record. The author has had the opportunity to study cotype specimens.

52. *Lachnus sabinianus* n.sp.

Record.—*Pinus sabiniana*, San Francisco (Compere).

In March, 1915, Harold Compere of the California State Insectary found a small infestation of a species of *Lachnus* on Digger Pine in the Golden Gate Park, San Francisco. Since this one collection, the species has not again been observed. Being unable to identify the species with any described in America, a description is herewith appended, the species being named after its host plant, *Pinus sabiniana*. All the specimens, including the types are in the collections of E. O. Essig and of the University of California, Berkeley. The specimens were all mounted in Canadian balsam before color notes were taken, so those in the following description are only approximately correct.

Alate viviparous female.—Rich chestnut-amber to dark brown. Antennal segments I and II, amber; III, yellowish with tips darker; IV, V, and VI, dark yellow to dusky. Prothorax, chestnut-brown. Thoracic lobes very dark brown to black. Beak, pale with tips dusky. Cornicles, black. Cauda and anal plate with distal margins black. Femora, chestnut-brown with base amber; tibiae, brown with amber ring near the base; tarsi, amber. Wing veins, grayffii stigma, dusky gray.

Measurements: Body 4.2 mm. long and 1.7 mm. wide at thorax. Antennae reach to base of abdomen, without secondary sensoria. I, 0.10 mm.; II, 0.09 mm.; III, 0.50 mm.; IV, 0.25 mm.; V, 0.19 mm.; VI, 0.08 mm.; total, 1.21 mm. Beak reaches to the base of the cornicles. Cornicles medium sized and of the usual *Lachnus* shape, being

Apterous viviparous female.—Chestnut-brown in color with black dorsal spots on abdomen. Antennal segments I and II, dark; III, dusky yellow with tip dark; IV, V, and VI slightly darker. Beak reaches to the base of the cornicles. Coxae, black; femora, black with basal one-fifth paler; tibiae, black with pale ring near base; tarsi, black. Cornicles, black and conspicuous. They measure 5.2 mm. in length and 3.3 mm. in width.

53. *Lachnus taxifolia* Swain

Figures 99-103

Swain, Trans. Am. Ent. Soc., vol. 44, p. 11, 1918.

Records.—*Pseudotsuga taxifolia*, Sacramento (Essig), Berkeley and San Francisco (Shinji).

This is a fairly common species found in colonies on the branches and trunks of Douglas fir in the San Francisco Bay and Sacramento Valley. It is interesting particularly because of the atrophied cornicles.

54. *Lachnus tujafilinus* (Del Guercio)

Figures 93, 105

Del Guercio, Redia, vol. 5, p. 287, 1909. *Lachneilla* (orig. desc.).Essig, Pom. Jour. Ent., vol. 3, p. 541, 1911. *Lachnus juniperi* DeGeer (desc.).Essig, Pom. Jour. Ent., vol. 4, p. 773, 1912. *Lachnus juniperi* DeGeer (list).

Davidson, Jour. Econ. Ent., vol. 7, p. 127, 1914 (list).

Records.—*Thuja occidentalis*, Claremont, Santa Paula (Essig); Palo Alto, Walnut Creek (Davidson); Stanford University, March, 1912 (Morrison); San Diego, March, 1916; Riverside, October, 1916, March, 1917.

This oddly marked *Lachnus* is more or less common throughout California wherever arborvitae is cultivated. The apterous females are the most common, and are easily recognized by the odd markings on the dorsum of the abdomen (see Essig's illustrations). Occasionally the alate females are found, Davidson finding some in April, Morrison and the author in March. The author has observed the larvae of *Coccinella californica* feeding on them in Riverside.

55. *Lachnus vanduzeei* n.sp.

Figure 88

Records.—*Picea* sp., Berkeley, September, 1914 (Essig, E. P., Van Duzee).

In September, 1914, E. P. Van Duzee collected a few specimens of a large *Lachnus* on a species of spruce in Strawberry Canyon, near Berkeley. Later in the same month Essig found specimens on the same tree. The following fall the author hunted for the species,

but was unable to find any specimens, the tree on which it was first found having been cut down. In the following description the color notes are not absolutely accurate, as they were taken from material mounted in balsam. This species is named after its first collector, Mr. E. P. Van Duzee, of the University of California. Type specimens are in the collection of the University of California.

Alate viviparous female.—The alate viviparous females are of a dark muddy color, as near as can be judged from the mounted specimens. The antennae are: I and II, dusky; III and IV, pale with apical half dusky; V, pale with the apex or apical third dusky; VI, pale with the apex and spur dusky. The measurements of the segments are: I, 0.09 mm.; II, 0.07 mm.; III, 0.5 mm.; IV, 0.26 mm.; V, 0.27 mm.; VI, 0.16 mm. The sensoria are located as follows: III, 10–12; IV, 2–3; V, 2–3; VI, 1. They are large and circular, and quite evenly distributed in a line on each segment. The beak reaches to the base of the cauda. The coxae are black, the femora amber on the basal half and black on the apical, the tibiae are black with an amber ring near the base, the tarsi are black. The first joint of the hind tarsus is not one-third the length of the second, the first measuring 0.08 mm., and the second 0.26 mm. The wings are quite large, with a very distinct stigma. The costal vein is grayish-brown, the subcostal brown. The stigma is long and brown, the stigmal vein being pale brown and slightly curved throughout its entire length. The first and second discoidals are distinct and pale brown, the second discoidal being slightly curved near the tip. The third discoidal is indistinct and twice-branched, the angles of the branches being very acute.

Apterous viviparous female.—Prevailing color, amber-brown, with the abdomen mottled gray, brown, and black. The head is brown with anterior margin amber. The antennae are colored as follows: I, amber; II, amber; III, amber with tip dusky; IV, amber with tip dusky; V, amber with apical two-thirds dusky; VI, dusky. The beak reaches to the base of the cauda. The femora are brown with the bases amber, the tibiae and tarsi brown. The first joint of the hind tarsus is scarcely more than one-third the length of the second. In four tarsi measured, the relative lengths of the joints were: 0.07 to 0.23 mm.; 0.08 to 0.23 mm.; 0.08 to 0.28 mm.; and 0.07 to 0.25 mm. The cornicles are conspicuous and dark, the cauda well rounded and dark on its posterior edge. The lengths of the antennal segments are: I, 0.1 mm.; II, 0.1 mm.; III, 0.56 to 0.57 mm.; IV, 0.21 to 0.23 mm.; V, 0.22 to 0.28 mm.; VI, 0.15 to 0.16 mm.

Group **Aphidina** Wilson

Wilson, Ann. Ent. Soc. Am., vol. 3, p. 314, 1910.

This group as considered by Wilson consists of three tribes: Trichosiphini, Macrosiphini, and Aphidini. The first of these contains two genera found only in the Asiatic islands, so it will not be considered in this paper. This group contains quite closely related genera, and in many cases it is quite hard to distinguish between them. Following is a brief extract from Wilson's paper (cited above):

In studying closely related genera the development of the external characters may be placed in five divisions: (1) the antennae and spur; (2) the antennal tubercles; (3) the development of the nectaries [cornicles]; (4) the development of the cauda; (5) the development of the wing venation. In a group of insects as pliable as the present one, any one or two of these characters may be either under- or over-developed and it is necessary to place the genera according to the greatest development. Of all the characters which show this variation the wings show what may be true of all these characters.

The two tribes have been separated from one another on the character of the antennal tubercles, as Wilson says in the same paper:

The division is made between species with distinct antennal tubercles and those having none or at the most indistinct tubercles. However, should a certain species have distinct antennal tubercles with the other characters [of the *Macrosiphini*] wanting, then it would have to go into the next tribe [*Aphidini*].

The keys to the tribes and genera below have been formulated by the author, following, however, those of Wilson, Van der Goot, and Mordwilko.

1. Antennal tubercles well formed. Antennae usually as long as or longer than the body. Apterae often with sensoria on the third antennal segment. Body never with lateral tubercles on the seventh abdominal segment. Cornicles variable but usually about one-fourth the length of the body or longer Tribe **Macrosiphini**
- Antennal tubercles absent or more or less indistinct. Antennae seldom longer than the body. Apterae seldom with sensoria on the third antennal segment. Body with lateral tubercles on at least the seventh abdominal segment Tribe **Aphidini**

Tribe **Macrosiphini** Wilson

Wilson, Ann. Ent. Soc. Am., vol. 3, p. 314, 1910.

To a large extent the author has followed Wilson in the placing of the genera, but in a few cases he has not. This is noticeable in *Toxoptera*, which is considered by Wilson as belonging to this tribe,

while the author feels that it is better associated with the Aphidini, inasmuch as the antennal tubercles are very small and more or less indistinct and as the antennae are scarcely as long as the body. Van der Goot's genus, *Myzaphis*, has been accepted for the two species, *Myzus rosarum* (Walker) and *Aphis abietina* Walker, and is included with the Aphidini. The species *Aphis nymphaeae* Linn., which Wilson uses as the type of *Rhopalosiphum*, has been taken from this genus and placed in *Siphocoryne*, chiefly because of the apparent absence of antennal tubercles and of the presence of distinct tubercles on the seventh abdominal segment. Therefore *Aphis persicae* Sulzer takes the place as type of the genus *Rhopalosiphum*.

KEY TO CALIFORNIA GENERA

1. Cornicles cylindrical, or at most but very slightly swollen on one side (figs. 122, 152) 4
- Cornicles distinctly swollen toward apex, or clavate (figs. 109, 113, 119) 2
2. Antennal tubercles very large and tapering but not gibbous on the inner side; the bases of the antennae being more or less approximate (fig. 107).
Nectarosiphon Schouteden
- Antennal tubercles distinct, but not large and tapering as above, being more or less toothed or gibbous on the inner side; the bases of the antennae not approximate (figs. 108, 111) 3
3. Antennal tubercles short and wedge-shaped, the outer side not evident (fig. 108). Cauda ensiform and of medium size. Antennae at most but slightly longer than the body **Rhopalosiphum** Koch
- Antennal tubercles short, but not wedge-shaped (fig. 111). Antennae considerable longer than the body. Cauda very large and long.
Amphorophora Buckton
4. Antennal tubercles large and as long on the outer as on the inner side (fig. 106) 5
- Antennal tubercles with outer side shorter than inner, or not evident (figs. 112, 115, 116) 7
5. Cornicles tapering, longer than cauda which is ensiform (fig. 152). Wing venation regular, with third discoidal twice-branched.
Macrosiphum Passerini
- Cornicles and cauda variable. Wing venation irregular and very striking with veins either wanting or combined, and shaded 6
6. Antennal tubercles with short upper inner angle. Cauda shorter than cornicles and tapering. Stigmal and third discoidal veins meet in a broad dark band, giving the wing the appearance of having a closed triangular cell (fig. 110) **Idiopterus** Davis
- Antennal tubercles with small rounded tubercle at the upper inner angle. Cornicles slightly constricted in the middle and at the tip. Wing venation variable, but usually the stigmal and third discoidal veins are partly joined and form a distinct, closed, four-sided cell **Pentalonia** Coquerel
7. Antennal tubercles and first antennal segment with a strong tooth on the inner side of each (figs. 115, 116). Cauda short and tapering (fig. 118). Cornicles cylindrical and tapering slightly with tip outcurved (fig. 117).
Rhorodon Passerini

- Antennal tubercles with a distinct but not prominent blunt projection forming the inner angle (fig. 112), but the prominent teeth as above are lacking. Cauda short, tapering, and usually triangular (fig. 121). Cornicles as above, being cylindrical, with a slight tapering from base to apex, and often slightly outcurved at tip (fig. 122) **Myzus** Passerini

21. Genus **Amphorophora** Buckton

Buckton, Monog. Brit. Aphides, 1876. Type *A. ampullata* n.sp.

KEY TO CALIFORNIAN SPECIES⁹

- Cornicles pale, or at most slightly dusky, swollen and vasiform (fig. 113). VI spur longer than III, the latter with 35-45 sensoria **rubi** (Kalt.)
 Cornicles black, greatly dilated in apical one-half (fig. 161). VI spur shorter than III, latter with 13-17 sensoria **latysiphon** Davidson

56. **Amphorophora latysiphon** Davidson

Figure 161

Davidson, Jour. Econ. Ent., vol. 5, p. 408, 1912 (orig. desc.).

Records.—*Vinca major*, San Jose (Davidson); Courtland, Contra Costa County (Davidson); Stanford University, 1912 (Morrison, Essig). *Convolvulus arvensis*, San Jose (Davidson). *Solanum tuberosum*, Walnut Creek, Contra Costa County, 1915 (Davidson).

This species has been found sparingly in the San Francisco Bay region on periwinkle, morning-glory, and potato tubers, although it has never seemed to be common. The author has not collected it, his only specimens being some taken by Essig on periwinkle near Stanford University. The odd shape of the cornicles is a distinguishing character.

57. **Amphorophora rubi** Kalt.

Figures 111, 113, 162

Kaltenbach, Monog. d. Pflanzenläuse, p. 23, 1843. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 411, 1912 (list).

Shinji, Can. Ent., vol. 49, p. 52, 1917 (list).

Records.—*Rubus parviflorus*; San Jose (Davidson); *Rubus* spp., Walnut Creek, 1915 (Davidson); Berkeley (Shinji).

This species has been taken a few times on thimble-berry in the San Francisco Bay region. Davidson writes that he has also found it on blackberry and loganberry in the vicinity of Walnut Creek,

⁹ G. O. Shinji (Can. Ent., vol. 49, p. 51, 1917) described an aphid from *Cicuta virosa* var. *californica* in Berkeley, which he called *Amphorophora cicutae* n.sp. The author has never seen specimens, so does not feel that he can recognize this as a good species. Of some half dozen new (?) species described by Shinji the author has found none, on examining specimens, that are good species, hence he cannot recognize this one at present.

Contra Costa County. The author has recently received specimens from Gillette of an alate viviparous female and apterous oviparous females taken in the vicinity of Fort Collins, Colorado. Inasmuch as the descriptions of this species are inadequate and not readily accessible it has been thought best to give here brief descriptions of the different forms. As no color notes were received with the specimens they must necessarily be omitted.

Alate viviparous female (from Fort Collins, Colorado).—Antennae half as long again as the body, dusky, and placed on small but distinct tubercles. From the mounted material it appears as if III were dusky, IV, pale with extreme tip dusky; V, pale with apical one-third dusky; and VI dusky. VI spur is the longest segment, followed by III, IV, V, VI base, I, and II. The usual primary and accessory sensoria are present on VI base, and the primary sensorium on V. Secondary sensoria are present only on III. These are small, circular, irregular-sized, and irregularly placed along the whole length of the segment. The number (35 to 40) is such as to make the segment appear tuberculate. The beak is quite large and long, reaching to or slightly beyond the third coxae. The thorax is dusky. The wings fairly large, and normal. The second branch of the third discoidal vein arises nearer to the base of the first branch than to the apex of the wing. Normally the measurements are as follows: From the base of the second branch of the third discoidal to the tip of the wing is about 0.8 mm., from the base of the first branch to the base of the second 0.4 mm., from the apex of the first branch to the apex of the second 0.29 mm. In one case the base of the second branch was 1.02 mm. from the apex of the wing, and but 0.034 mm. from the base of the second, while the apices of the two branches were but 0.187 mm. apart. The legs are long, femora pale with apical one-fourth dusky, tibiae and tarsi dusky. The abdomen is pale with some slight dorsal dark markings, these being indistinct in the mounted specimens. The cornicles are fairly long, clavate on the apical one-half or two-thirds, dusky throughout, and with the extreme tip reticulated. In length they are somewhat shorter than III, but longer than IV. The cauda is pale, short, and triangular, being about equal in length to the hind tarsi.

Measurements: body length, 1.785 mm.; antennae total, 2.788 mm.; III, 0.68 mm.; IV, 0.51 mm.; V, 0.408 to 0.425 mm.; VI, base, 0.12 mm.; VI, spur, 0.867 to 0.884 mm.; cornicles, 0.578 to 0.646 mm.; cauda, 0.102 mm.; hind tarsi, 0.102 mm.; wing length, 3.128 mm.; width, 1.292 mm.; expansion, 6.8 mm.

Apterous oviparous female (Fort Collins, Colorado).—Pale throughout, with many small hairs scattered over the body. Most of these hairs are simple, but some especially on the front of the head and on the bases of the antennae, are capitate. Antennae slightly longer than the body, pale, with VI and the apices of the other segments dusky. VI spur and III are subequal or either one may be slightly longer than the other. These are followed by IV, V, VI base, I, and II. The usual primary and accessory sensoria are present on VI base, and the primary sensorium of V. Secondary sensoria are present only on III, and number about nine or ten. These are small, circular, but varying in size, and are arranged in a more or less even line along the basal one-half to two-thirds of the segment. Beak pale, with tip dusky, quite large and long, reaching to or beyond the third coxae. Thorax and legs normal, except the hind tibiae which are quite long, and furnished with a large number of sensoria. These sensoria cover practically the whole joint. Cornicle very long and large, curved outward, pale, with apex dusky, and with distinct reticulations at the extreme tip. They are markedly larger than in the alate viviparous females, being considerably longer than the third antennal segment, and in some cases even half as long again. The cauda is small, pale, and triangular, although somewhat larger in the viviparous female.

Measurements: body length, 2.04 mm.; width of thorax, 0.595 mm.; antennae total, 2.446 mm.; III, 0.646 to 0.697 mm.; IV, 0.442 to 0.459 mm.; V, 0.356 to 0.374 mm.; VI, base, 0.136 mm.; VI, spur, 0.663 mm.; cornicles, 0.918 to 0.952 mm.; cauda, 0.187 mm.; hind tarsi, 0.136 mm.

22. Genus *Idiopterus* Davis

Davis, Ann. Ent. Soc. Am., vol. 2, p. 198, 1909. Type, *I. neprelepids* n.sp.

58. *Idiopterus nephrelepids* Davis

Figure 110

Davis, Ann. Ent. Soc. Am., vol. 2, p. 198, 1909 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910 (list).

Essig, Pom. Jour. Ent., vol. 3, p. 538, 1911 (list).

Records.—*Nephrolepis exaltata*, Santa Paula (Essig), Palo Alto, April, 1915, San Diego, March to May, 1916; Riverside, February, 1917: *Cyrtonium fulcotum*, Berkeley, March, 1915 (Essig); ferns (unidentified species of house ferns), Stanford University (Davidson, Morrison); *Viola* sp., Claremont (Essig).

This small black aphid is often found in houses and nurseries, and occasionally out of doors, on the fronds of various kinds of house

ferns, particularly the Boston fern. Essig has also found it on violets in the vicinity of Pomona College. The alate females have the wings beautifully marked with black and white.

23. Genus **Macrosiphum** Passerini

Passerini, Gli Afidi, 1860. Type *Aphis rosae* Linn.

KEY TO CALIFORNIA SPECIES

Alate viviparous females

1. Cornicles slightly clavate on one side, somewhat as in *Rhopalosiphum*.
tulipae (Monell)
- Cornicles not clavate 2
2. III as long as V and VI (base and spur) **sonchella** (Monell)
- III not as long comparatively 3
3. III pale, IV, V, and VI dusky **jasminum** (Clarke)
- Not so; if IV, V, and VI are dusky then III is also, except perhaps the base;
or if III is pale throughout then at least the greater part of IV and V are
also pale 4
4. VI (base and spur) shorter than III, but V and VI together are longer than
III **baccharadis** (Clarke)
- VI (base and spur) not shorter than III 5
5. Secondary sensoria on III, IV, and V. Cornicles not reticulated.
heucherae (Oestlund)
- No secondary sensoria on V 6
6. Secondary sensoria on both III and IV. Cornicles with tips at least reticulated
(fig. 152) 7
- No secondary sensoria on IV 10
7. Cornicles and cauda subequal in length, the former being more or less bottle-
shaped **sanborni** Gillette
- Cornicles longer than cauda 8
8. Cauda light green. Secondary sensoria only occasionally present on IV and
then very small and indistinct **rosae** (Linn.)
- Cauda dark (brown or black). Seven or more distinct secondary sensoria
on IV 9
9. Body with capitate setae, especially on head and antennae.
artemisiae (Fonse.)
- Body without capitate setae. Abdomen with dark dorsal markings.
lactucae (Kalt.)
10. Cornicles with at least tips reticulated (fig. 132) 14
- Cornicles with no reticulations (fig. 156) 11
11. Body with fan-shaped setae **artemismicola** (Williams)
- Body without fan-shaped setae 12
12. Distal two-thirds of cornicles black **orthocarpus** (Dvdn.)
- Only tip of cornicles black 13
13. Cornicles long and slender. About 18 secondary sensoria in a row on III
(fig. 130) **pisi** (Kalt.)
- Cornicles shorter and heavier. About 25 to 30 sensoria scattered irregularly
along III (fig. 157) **dirhodum** (Walker)
14. Cornicles with more than apical one-half reticulate (fig. 149).
ludoviciana (Oestlund)
- Cornicles with less than apical one-half reticulated (fig. 128) 15

15. Cornicles dusky for practically their entire length 20
 — Cornicles with less than apical one-half dusky 16
16. Cornicles considerably longer than III, with apical portion curved outward.
 About a dozen, medium-sized sensoria in a straight line along basal two-thirds of III (fig. 131) *californicum* (Clarke)
 — Cornicles not considerably longer than III 17
17. Cornicles and VI spur subequal, the former fairly long, slightly curved outward and slightly swollen before the tip (fig. 128) *stanleyi* Wilson
 — Cornicles considerably shorter than VI spur, and not swollen before the tip 18
18. Secondary sensoria in a fairly straight line on III. Body not pulverulent 19
 — Body covered with a slight pulverulence. III with about 30 fairly large-sized sensoria, more or less scattered along the entire length (fig. 143).
albifrons Essig
19. Cornicles about half the length of VI spur and considerably shorter than III, the latter with about 20 to 30 secondary sensoria *pteridis* Wilson
 — Cornicles about two-thirds as long as VI spur and slightly shorter than III, the latter with about 15 sensoria (fig. 133) *cucurbitae* (Thomas)
20. Ground or basal color of abdomen green 21
 — Ground or basal color of abdomen red, brown, or black 24
21. Cornicles green, sometimes dusky at apex *solanifolii* (Ashmead)
 — Cornicles black 22
22. III with a small number (9-15) of secondary sensoria on basal one-half (fig. 135); longer than VI spur *granarium* (Kirby)
 — III with some 30 or more sensoria scattered along its entire length (figs. 151, 159); subequal to or shorter than VI spur 23
23. Cornicles and III subequal. Tibiae with apices only dusky *rosae* (Linn.)
 — Cornicles longer than III. Tibiae dusky throughout.
rudbeckiae (Fitch) n.var. *madia*
24. Cauda pale 25
 — Cauda dusky 27
25. III and VI spur subequal *rosae* (Linn.)
 — III shorter than VI spur 26
26. Cauda about one-half as long as cornicles, the latter shorter than IV.
chrysanthemi (Oestlund)
 — Cauda slightly more than one-half as long as cornicles, the latter equal to or longer than IV *rudbeckiae* (Fitch)
27. III and VI spur subequal 28
 — III longer than VI spur *taraxici* (Kalt.)
28. Body yellowish-brown in color; legs same except tarsi and tips of tibiae and femora which are dusky to black *valerianae* (Clarke)
 — Body dark reddish-brown to black in color; legs dusky throughout.
ambrosiae (Thomas)

*Apterous viviparous females*¹⁰

1. Cornicles clavate on one side, somewhat as in *Rhopalosiphum*.
tulipae (Monell)
 — Cornicles not so, being cylindrical or subcylindrical 2

¹⁰ Only the species of which there are specimens available to the author, or of which there are adequate descriptions, are included in this key. The species represented in the author's collection are marked with an asterisk (*). The author recognizes the great difficulty in separating the apterae of various species, particularly in this genus, and offers this key merely as a slight aid toward the recognition of the better known species.

2. III without or at most with only a few secondary sensoria (0-12) 11
 — III with several (over 12) secondary sensoria scattered along the greater part of its length 3
3. Cornicles short and tapering, being somewhat bottle-shaped and not distinctly longer than the cauda *sanborni* Gillette*
 — Cornicles normal, being cylindrical and considerably longer than the cauda 4
4. III and IV with secondary sensoria *heucherae* (Oestlund)
 — IV without secondary sensoria 5
5. General body color dark, being red, wine, brown or black 6
 — General color lighter, usually being a shade of green 8
6. Cauda black. Legs black, except the bases of the femora *taraxici* (Kalt.)
 — Cauda pale. Legs with at least the bases of the femora and tibiae not black 7
7. Legs green, except tarsi and apices of femora and tibiae. Cauda not more than half the length of the cornicles. Not more than ten to twelve sensoria on the basal one-third of III *rosae* (Linn.)*
 — Legs black, except bases of femora and tibiae, which are light brown. Cauda more than half the length of the cornicles. A considerable number of sensoria scattered over more than the basal one-half of III. *rudbeckiae* (Fitch)*
8. Cornicles subequal to or shorter than III. Body covered with a whitish pulverulence 9
 — Cornicles distinctly longer than III. Body without whitish pulverulence 10
9. Cornicles, except tip, and cauda green; the former subequal in length to III and about twice as long as cauda *albifrons* Essig*
 — Cornicles black, cauda yellow or light brown; the former considerably shorter than III and not twice as long as cauda *ludoviciana* (Oestlund)*
10. Cauda quite broad and blunt at end. Cornicles with not more than apical one-sixth reticulated *rosae* (Linn.)*
 — Cauda slender and pointed. Cornicles with apical one-fourth reticulated. *rudbeckiae* (Fitch) n.var. *madia**
11. Body covered with capitate or fan-shaped setae 12
 — Body without specialized setae 14
12. Setae with fan-shaped tips and thickly covering the body. Cornicles slender and imbricated for their entire length *artemisicola* (Williams)*
 — Setae capitate and only sparsely covering body 13
13. Cornicles fairly stout, with tips reticulated, and about twice as long as cauda. *artemisiae* (Fonse.)
 — Cornicles slender, with no reticulations, and considerably more than twice the length of the cauda *pteridis* Wilson
14. Cornicles with tips at least reticulated 16
 — Cornicles with no reticulations 15
15. Cornicles very long and slender. Antennae considerably longer than body. *psi* (Kalt.)*
 — Cornicles shorter and heavier. Antennae at most but slightly longer than body *dirhodum* (Walker)*
16. Cornicles for the most part dusky or black 17
 — Cornicles mostly pale or green 19
17. Cornicles and III subequal. Body not pulverulent 18
 — Cornicles considerably shorter than III. Body more or less pulverulent. *ludoviciana* (Oestlund)*

18. III with but two or four sensoria near base; longer than VI spur.
 *granarium* (Kirby)*
 — III with six or so sensoria on basal one-half; shorter than or equal to VI
 spur*rosae* (Linn.)*
 19. Cornicles longer than III 20
 — Cornicles at most subequal to III 21
 20. Antennae pale, except VI and the apices of III to V. Cornicles slightly
 swollen near distal end*stanleyi* Wilson*
 — Antennae dusky, except III, basal part of IV, and perhaps the extreme base
 of V. Cornicles long, slender, and out-curved*californicum* (Clarke)*
 21. Cauda broad, and blunt, with the sides almost parallel and about half as long
 as cornicles*lactucae* (Kalt.)*
 — Cauda slender-pointed, and more than half as long as cauda 22
 22. VI spur and III subequal*solanifolii* (Ashmead)*
 — VI spur considerably longer than III*cucurbitae* (Thomas)*

59. *Macrosiphum albifrons* Essig

Figures 143, 144

Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909. *Macrosiphum* sp. (list).

Essig, Pom. Jour. Ent., vol. 3, p. 543, 1911 (orig. desc.).

Records.—*Lupinus* sp., Santa Paula (Essig); Stanford University (Davidson); Jasper Ridge, Coast Range Mountains, Santa Clara County, April, 1912 (V. G. Stevens); Berkeley, April, 1915 (Geo. Shinji); Mount Hood, Oregon, August, 1916 (E. A. McGregor).

This large, flocculent aphid is found occasionally infesting various lupines throughout the Pacific Coast, from southern California north, well into Oregon. The author has specimens from Berkeley and Oregon, although he has never collected it himself.

60. *Macrosiphum ambrosiae* (Thomas)?

Thomas, Ill. Lab. Nat. Hist., Bull. 2, p. 4, 1878. *Siphonophora* (orig. desc.).

Sanborn, Kans. Univ. Sci., Bull. 3, p. 74, 1904 (desc.).

Records.—*Helianthus annuus*; Orange (T. D. A. Cockerell); San Diego, April, 1916.

In 1915 the author received a few specimens of this species from T. D. A. Cockerell from Orange, and in 1916 he collected it once on sunflower in Exposition Park, San Diego. At first it was thought to be *M. sonchi* (Linn.), and was so reported by Cockerell. Since then it was identified by J. J. Davis as probably *M. ambrosiae* (Thomas).

61. *Macrosiphum artemisiae* (Fonse.)

Figures 142, 145

Boyer de Fonscolombe, Ann. Ent. Soc. France, vol. 10, p. 162, 1841. *Aphis* (orig. desc.).

Essig, Pom. Jour. Ent., vol. 3, p. 546, 1911. *Macrosiphum frigidæ* (Oest.) (desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 133, 1914. *Macrosiphum frigidæ* (Oest.) (list).

Wilson, Trans. Amer. Ent. Soc., vol. 41, p. 97, 1915 (desc.).

Records.—*Artemisia californica*; Santa Paula (Essig); Walnut Creek, Contra Costa County (Davidson).

Occasionally this species is found infesting the tender shoots of the common California sage brush. It is characterized by the presence of capitate hairs scattered sparsely over the body, particularly of the apterous female. The synonymy above is after Wilson, who lists *M. frigidæ* (Oestlund) as a synonym of *artemisiae* (Fonse.).

62. *Macrosiphum artemisicola* (Williams)

Figures 146, 147

Williams, Univ. Neb. Studies, vol. 10, p. 73, 1910. *Siphonophora* (orig. desc.).

Wilson, Trans. Am. Ent. Soc., vol. 41, p. 96, 1915 (desc.).

Records.—*Artemisia tridentata*, *A. vulgaris*; Oregon (California) (Wilson).

Although there is no published record of the presence of this species in California it is included here on Wilson's authority. He stated to the author that he had found it in California, although he failed to give any date or locality record. This is characterized by the fan-shaped setae which thickly cover the body of the apterae, and which are present on the ventral side of the abdomen of the alates. The author has specimens taken by R. W. Haegele in the summer of 1915 on *Artemisia* sp. near Canton, Montana.

63. *Macrosiphum baccharadis* (Clarke)

Clarke, Can. Ent., vol. 35, p. 254, 1903. *Nectarophora* (orig. desc.).

Record.—*Baccharis* sp., Berkeley (Clarke).

This species is one of those described by Clarke, but since then unknown. It is possible that it is *M. rudbeckiae* (Fitch), which is so common on *Baccharis* throughout California.

64. *Macrosiphum californicum* (Clarke)

Figures 131, 132

- Clarke, Can. Ent., vol. 35, p. 254, 1903. *Nectarophora* (orig. desc. apterae).
Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909 (list).
Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910 (list).
Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911 (list).
Essig, Pom. Jour. Ent., vol. 3, p. 548, 1911. *M. laevigatae*, n.sp. (orig. desc.).

Records.—*Salix* sp.; Newcastle, Placer County (Clarke); Stanford University and Penryn, Placer County (Davidson); Stanford University, November, 1914 (Morrison), May, 1915; Berkeley, April, 1915 (Shinji); August, 1915, *Salix laevigata*; Santa Paula (Essig); Riverside, May, 1917.

Clarke described the apterous females of a species of *Nectarophora* (*Macrosiphum*) from specimens taken on willow in Placer County. Because of the extremely long cornicles it is possible to identify this with specimens taken since throughout the San Francisco Bay region on various species of willows. Essig's *M. laevigatae* from Santa Paula is the same species, having been compared by the author with specimens from Stanford University and Berkeley. Morrison has taken the males and oviparous females of this species in the vicinity of Stanford University in November, 1914. The author has reared specimens of *Aphidius polygonaphis* Fitch, and *Praon simulans* Prov. from this species taken in Berkeley.

65. *Macrosiphum chrysanthemi* (Oest.)

- Oestlund, 14th Rep. Geol. Surv. Minn., vol. 22, 1886. *Siphonophora* (orig. desc.).
Davidson, Jour. Econ. Ent., vol. 5, p. 411, 1912 (list).

Record.—Undetermined species of *Compositae*; Courtland (Davidson).

This is a doubtful species taken by Davidson at one time from an undetermined composite near Courtland. The author is entirely unacquainted with the species.

66. *Macrosiphum cucurbitae* (Thos.)

Figures 133, 134

- Thomas, 8th Ann. Rep. Illinois St. Ent., p. 66, 1879. *Siphonophora* (orig. desc.).

Record.—*Cucurbita* sp., Hayward, Alameda County, July, 1915 (Roy E. Campbell); Los Angeles, May, 1917.

In July, 1915, Roy E. Campbell of the Bureau of Entomology, sent the author specimens of a *Macrosiphum* sp. from squash in Hayward. In 1917 the author found the same species abundantly on squash in Los Angeles. These the author identified as being specimens of *M. cucurbitae* (Thomas). Later J. J. Davis verified the determination. This is a new record for California. As the available descriptions of this species are quite inadequate, the author gives herewith a few descriptive notes taken from these specimens.

Alate viviparous female.—Antennae longer than the body, placed on distinct frontal tubercles, dusky except I, II, and extreme base of III. The spur of VI is the longest segment, followed by III, which is about four-fifths as long. IV and V are subequal, and almost as long as III. The usual primary and accessory sensoria are present on V and VI. Secondary sensoria are present on III (fig. 133), being small, circular, numbering about 14 to 15, and arranged in a fairly even row along the whole length of the segment. Beak pale with dusky tip, reaching to the second coxae. Thorax and abdomen green, the thoracic lobes not conspicuously darkened. Cornicles (fig. 134) green with apical one-third dusky, equal to or slightly longer than III, imbricated with tip reticulated. Cauda large, pale, vasiform, slightly more than half the length of the cornicles, reaching to their apices. Wings and legs normal.

Measurements: Body length, 2.3 mm.; antennae total, 3.25 to 3.35 mm.; III, 0.685 to 0.714 mm.; IV, 0.629 to 0.646 mm.; V, 0.603 to 0.612 mm.; VI, base, 0.136 to 0.153 mm.; VI, spur, 0.935 to 0.696 mm.; cornicles, 0.714 to 0.731 mm.; cauda, 0.408 mm.

67. *Macrosiphum dirhodum* (Walker)

Figures 156, 157

Walker, Ann. Nat. Hist., (2), vol. 3, p. 43, 1848. *Aphis* (orig. desc.).

Theobald, Jour. Econ. Biol., vol. 8, p. 128, 1913 (desc.).

Patch, Maine Agr. Exp. Sta., Bull. 233, p. 268, 1914 (note).

Gillette, Jour. Econ. Ent., vol. 8, p. 103, 1915 (note).

Record.—Rose, Santa Ysabel (3000 feet altitude), San Diego County, May, 1916; Riverside, April, 1917.

The author found this species sparingly on rose near Santa Ysabel, San Diego County, in May, 1916, and again in April, 1917, in Riverside. According to Gillette, this species passes the winter on rose, and the summer on various grains and grasses, as *M. rosae* (Linn.)

may do. These are the only records of it in California. The author has compared it with specimens taken by R. W. Doane in 1915 on grain in Utah.

68. *Macrosiphum granarium* (Kirby)

Figures 135, 148

Kirby, Linn. Soc. Trans., vol. 4, p. 238, *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 411, 1912 (list).

Theobald, Jour. Econ. Biol., vol. 8, p. 58, 1913 (desc.).

Davidson, Mon. Bull., Cal. Comm. Hort., vol. 6, p. 65, 1917 (note).

Records.—*Graminaceae* (various species); San Jose (Davidson); Stanford University, January to May, 1915; Berkeley, March, 1915: *Typha latifolia* (Davidson).

This is a more or less common species of *Macrosiphum* on various grains and grasses in the San Francisco Bay region during the winter and spring. In late spring and early summer, as the grasses begin to dry out, it leaves them for the cat-tail rush or California tule (Davidson, 1917). In the late fall or early winter it returns to the grains and grasses, where it passes the winter in the viviparous forms.

69. *Macrosiphum heucherae* (Thomas)

Thomas, 8th Ann. Rep. Illinois St. Ent., p. 66, 1879. *Siphonophora* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 8, p. 427, 1915 (desc.).

Record.—*Heuchera hartwegi*, Redwood Canyon, Contra Costa County (Davidson).

In the latter part of May, 1914, Davidson found all the forms, including the apterous and alate viviparous females, the apterous oviparous females, the alate males, and eggs on the flower stalks of alum root in Contra Costa County. Since his description no record has been made concerning the species. The author is unacquainted with it, having never seen specimens.

70. *Macrosiphum jasmini* (Clarke)

Clarke, Can. Ent., vol. 35, p. 252, 1903. *Nectarophora* (orig. desc.).

Record.—Jessamine, Berkeley (Clarke).

Since Clarke's description of the apterous viviparous females of this species it has never been found. Its identity is, therefore, unknown to the author.

71. *Macrosiphum lactucae* (Kalt.)

Kaltenbach, Monog. d. Pflanzenläuse, p. 199, 1857. *Nectarophora* (orig. desc.).

Sanderson, Can. Ent., vol. 33, p. 69, 1901. *Nectarophora* (desc.).

Essig, Univ. Calif. Publ., Entom., vol. 1, p. 328, 1917 (list).

Record.—*Cicorium intybus*, Rutherford, Napa County, 1916 (Essig).

This species has been taken only by Essig on chicory in Napa County during June, 1916. As its determination is doubtful the author gives herewith a brief description of the alate female.

Body pale to green, with the following parts more or less dusky: head, antennae, prothorax, thoracic lobes, apex of beak, tarsi, apical one-fifth to one-fourth tibiae, apical one-half femora, cornicles, anal plate, marginal spots on the abdominal segments, submarginal spots of the second and third abdominal segments, dorsal bands on the fourth and fifth, and the dorsum of the remaining abdominal segments. Eyes red.

The antennal tubercles are prominent and project rectangularly inward. A prominent frontal tubercle is present on the apex. The antennae are about half as long again as the body. The usual primary and accessory sensoria are present. On III there are from thirty-five to forty-five circular secondary sensoria; on IV from five to fifteen secondary sensoria. These two segments appear tuberculate. The beak reaches beyond the second coxae. The cornicles are longer than the cauda, and subequal in length to the fourth antennal segment. They are subcylindrical and fairly stout. The cauda is long and ensiform, reaching to the tip of the cornicles. The wings and venation are normal.

Measurements (of three specimens): Body length, 1.836 to 1.955 mm.; width of thorax, 0.765 to 0.833 mm.; antennae, total, 2.805 to 2.992 mm.; III, 0.680 to 0.697 mm.; IV, 0.441 to 0.527 mm.; V, 0.391 to 0.425 mm.; VI, base 0.085 to 0.119 mm.; VI, spur 0.952 to 1.105 mm.; cornicles, 0.441 to 0.493 mm.; cauda, 0.238 to 0.272 mm.; hind tarsi, 0.136 to 0.153 mm.; wing, length, 3.145 to 3.315 mm.; width, 0.952 to 1.139 mm.; expansion, 7.36 to 7.87 mm.

72. *Macrosiphum ludoviciana* (Oestund)

Figures 136, 148

Oestlund, Minn. Geol. Nat. Hist. Surv., vol. 14, p. 23, 1886. *Siphonophora* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 136, 1914 (list).

Wilson, Trans. Am. Ent. Soc., vol. 12, p. 98, 1915 (desc.).

Records.—*Artemisia heterophylla*; Walnut Creek, Contra Costa County (Davidson), Berkeley, 1915 (Shinji); *Artemisia dracunculoides*, *Convolvulus* sp., *Stachys bullata*, Berkeley, 1915 (Shinji).

This species is quite common in the San Francisco Bay region on various species of sagebrush. George Shinji has taken it also on hedge-nettle and bindweed in Berkeley. It is distinguished from other sage-infesting species of *Macrosiphum* by the fact that the body of the apterous females is covered with pointed setae as opposed to the fan-shaped setae of *M. artemisicola* (Williams), and the capitate setae of *M. artemisiae* (Fonse.).

73. *Macrosiphum orthocarpus* Davidson

Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910 (list).

Record.—*Orthocarpus purpurascens*; Stanford University (Davidson).

Since Davidson found the specimens on owl-clover from which he described this species, it has not again been taken.

74. *Macrosiphum pisi* (Kalt.)

Figures 130, 150

Kaltenbach, Monog. d. Pflanzenläuse, p. 23, 1843. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910 (list).

Essig, Pom. Jour. Ent., vol. 2, p. 336, 1910. *Nectarophora* (desc.).

Branigan, Mon. Bull. Cal. Comm. Hort., vol. 4, p. 285, 1915. *M. destructor* (Johnson) (list).

Davis, U. S. Dept. Agr., Bull. 276, p. 11, 1915 (list).

Records.—*Pisum sativum*; Claremont, Santa Ana, and Ventura (Essig); Alameda County (Brannigan); El Cajon, San Diego County, May, 1916: *Lathyrus odoratus*; Stanford University (Davidson, Morrison); San Diego, October, 1916: *Viola* sp.; Claremont, Santa Ana, Ventura (Essig); *Medicago* sp.; Holtville, Imperial County (V. L. Wildermuth): *Psorales macrostachya*; Santa Paula (Essig).

The pea aphid is quite common throughout the state, especially on garden and sweet peas. It has been taken a few times on other plants, such as alfalfa, violets, and leather-root, but it is uncommon. This species is readily distinguished by its bright, shining green color, large size, and long, slender, imbricated, but non-reticulated cornicles.

75. *Macrosiphum pteridis* Wilson

Figures 317, 318

Wilson, Trans. Am. Ent. Soc., vol. 41, p. 101, 1915 (orig. desc.).

Records.—*Pteris aquilina*; Walnut Creek, Contra Costa County, 1915 (Davidson).

This species has been found by Davidson on the fronds of common brake in the San Francisco Bay region. Wilson reported it as present throughout southern and western Oregon. There are a few specimens of the alate females in the author's collection, received from Davidson.

76. *Macrosiphum rosae* (Linn.)

Figures 106, 151, 152

Linnaeus, Syst. Nat. vol. 4, p. 73, 1735. *Aphis* (orig. desc.).Clarke, Can. Ent., vol. 35, p. 254, 1903. *Nectarophora* (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910 (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 399, 1911 (list).

Essig, Pom. Jour. Ent., vol. 5, p. 550, 1911 (desc.).

Carnes, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 398, 1912 (list).

Records.—Rose; through California from Humboldt County south to San Diego County (Clarke, Davidson, Morrison, Essig, Ferris, Shinji, the author).

This is the common pink and green aphid of roses, known the world over. The apterae are found most abundantly in the late winter and early spring on the buds and stems of rose. As the alates are matured they fly away, supposedly either to other rose bushes or to various grains and grasses. This past spring (1917) it has been very abundant in the vicinity of Riverside, but the previous spring (1916) in San Diego it was rare. There the most abundant rose aphid was *Myzaphis rosarum* (Walker).

77. *Macrosiphum rudbeckiae* (Fitch)Fitch, Cat. Homop. N. Y., p. 66, 1851. *Aphis* (orig. desc.).Essig, Pom. Jour. Ent., vol. 3, p. 400, 1911. *Aphis* (desc.).¹¹

Davidson, Jour. Econ. Ent., vol. 7, p. 137, 1914 (list).

Records.—*Ambrosia psilostachya*; Santa Paula (Essig); *Baccharis viminalis*; Santa Paula (Essig), Riverside, September, 1916; *Dipsacus fullonum*; San Jose (Davidson); *Helianthus annuus*; Riverside, September, 1916; *Salix* sp.; *Chrysanthemum*; Arlington, Riverside County, September, 1916; undetermined species of *Compositae*; Redwood Canyon, Contra Costa County, July, 1914 (R. W. Haeghele).

¹¹ In the drawings accompanying this description by Essig the following mistakes are noticeable: the third discoidal vein of the forewings is twice-branched instead of once-branched, and the third antennal segment of the apterous female bears several secondary sensoria instead of none, as figured.

This reddish-colored *Macrosiphum* is distributed abundantly through the San Francisco Bay region and southern California on various Compositae. In one case the author found it doing considerable damage to chrysanthemums by stunting and distorting the buds. Once he found it infesting the tender leaves and stalks of willow. The author reared specimens of *Diaretus rapae* Curt. from an infestation of this species taken on willow.

77a. ***Macrosiphum rudbeckiae*** (Fitch) var. ***madia*** n.var.

Figures 153, 154

In September, 1915, the author found a species of *Macrosiphum* infesting the heads of tarweed (*Madia sativa*) on the campus of the University of California, Berkeley. Specimens of *Praon simulans* Prao. were reared from this collection. Mounted specimens are almost identical with *M. rudbeckiae* (Fitch), but in life they differ in the coloration. Because of this it has been thought best to describe it herewith as a color variety of *M. rudbeckiae*, naming the variety. *madia*, after its host plant.

Host: *Madia sativa*.

Locality: Berkeley, California.

Date: September 12, 1915.

Collection number: AFS 70-15.

Alate viviparous female.—Prevailing color: dark-green, slightly pruinose. Head brownish (fuscous), about as long as broad, with distinct antennal tubercles. Antennae black, except I and II and the base of III, which are concolorous with the head. The spur is slightly longer than III; IV is next in length, followed by V, VI, and I, which are subequal, and II, which is the shortest segment. The spur is about six times as long as the base of VI. The usual primary sensoria are present on V and VI, and the usual accessory sensoria on VI. IV is without sensoria, III has 25-35 irregularly arranged, various-sized secondary sensoria placed along the whole length of the segment (fig. 154). The thorax is fuscous; the prothorax with rather distinct lateral tubercles. The beak is slightly dusky with the apical one-third black, reaching to the second coxae. The abdomen is greenish with a slight pulverulence, making it appear pruinose. The cornicles are long, slightly tapering, black except the basal one-third, which is concolorous with the abdomen, apical one-fifth reticulate (fig. 153). The cauda is long and pointed, pale (slightly reddish?), about one-half as long as the cornicles. The legs are black except the basal half of the femora and the coxae, which are greenish. The wings and venation are normal.

Measurements: Body length (exclusive of cauda), 2.11 mm.; width of thorax, 0.91 mm. Antennae: total, 2.07 mm.; I, 0.12 mm.; II, 0.09 mm.; III, 0.76 mm.; IV, 0.55 mm.; V, 0.47 mm.; VI, 0.12 mm.; spur, 0.78 mm.; cornicles, 0.91 mm.; cauda, 0.45 mm.; beak, 0.89 mm.; hind tarsus, 0.14 mm. Wing: length, 3.6 mm.; width, 1.25 mm.; expansion, 8.11 mm.

78. *Macrosiphum sanborni* Gillette

Figures 141, 155

Sanborn, Kans. Univ., Sci. Bull. 3, p. 73, 1904. *Macrosiphum chrysanthemi* (desc. ala. vivi.).

Gillette, Can. Ent., vol. 11, p. 65, 1908 (orig. desc. apt. vivi.).

Records.—Chrysanthemum; Stanford University, May, 1915; Riverside, March, 1917.

Twice has the author found this species: once a small infestation in the greenhouse of Stanford University, and once abundantly out of doors in Riverside. It is an interesting species in that it does not fit well into any known genus. Except for the cornicles it fits *Macrosiphum* and has been so considered. The cornicles are, however, short, being scarcely longer than the cauda, and are somewhat bottle-shaped, being considerably smaller at the apex than at the base.

79. *Macrosiphum solanifolii* (Ashmead)

Figures 137-140, 159-160

Ashmead, Can. Ent., vol. 12, p. 91, 1881. *Siphonophora* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903. *Nectarophora citrifolii* (Ashmead) (list).

Davidson, Jour. Econ. Ent., vol. 31, p. 380, 1910. *Macrosiphum citrifolii* (Ashmead) (list).

Essig, Pom. Jour. Ent., vol. 3, p. 592, 1911. *Macrosiphum citrifolii* (Ashmead) (desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 411, 1912 (list).

Patch, Maine Agr. Exp. Sta., Bull. 242, 1915 (desc.).

Records.—*Citrus* sp.; Azusa, Los Angeles County (Clarke); Lindsey, Tulare County (Clarke); Santa Paula (Essig); *Disporum hookeri*; Berkeley, May, 1915 (Shinji); *Solanum nigrum*; Stanford University, October, 1916 (Ferris); *Fuchsia* sp.; Berkeley, July, 1915; *Sonchus asper* and *S. oleraceus*; Stanford University, February, 1915; apple; Stanford University, May, 1915; El Cajon, San Diego County, July, 1916; *Atriplex* sp.; Berkeley, September, 1915; *Oxalis corniculata*, Riverside, February, 1917; *Deinandra fasciculata*, Riverside, February, 1917; *Erodium moschatum*; Pasadena, April, 1917 (R. E. Campbell); Riverside, April, 1917.

This "pink and green aphid of potato" is distributed throughout California on a large variety of plants. It is recognizable by the long reticulated cornicles and black antennae. When the author first examined specimens of *Macrosiphum citrifolii* (Ashmead) in Essig's collection he was struck with its resemblance to this species. In fact, after considerable study he could not find any constant differences. This was in 1915 in Berkeley. This past spring (1917) he had the opportunity in Riverside of making some transfer tests with specimens from oxalis. Migrants were placed under muslin bags on sucker growth of orange. It was observed that these settled there readily and produced young, demonstrating that the citrus species is the same as the other. On the strength of this *Macrosiphum citrifolii* (Ashmead) is listed as a synonym of this species.

80. *Macrosiphum sonchella* (Monell)?

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 21, 1879. *Siphonophora* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903. *Nectarophora* (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 380, 1910 (list).

Records.—*Sonchus* sp.; Berkeley, Newcastle, and Palo Alto (Clarke); Stanford University (Davidson).

According to Morrison the species listed as this by Davidson is not *Macrosiphum sonchella* (Monell), although he cannot say what it is. Consequently Clarke probably referred to the same species as did Davidson. As the author has never seen specimens he can make no statement as to its identity, so lists it as it has been heretofore.

81. *Macrosiphum stanleyi* Wilson

Figures 128, 158

Wilson, Proc. Ent. Soc. Brit. Columbia, January, 1915 (orig. desc.).

Record.—*Sambucus callicarpa californica*; Berkeley, June, 1915.

From the early part of June, 1915, until the middle of August, this species was very abundant on an elderberry tree in the Botanical Gardens of the University of California. By the latter part of August all specimens had disappeared. Since then the author has never seen the species. J. J. Davis kindly identified these specimens.

82. *Macrosiphum taraxici* (Kalt.)

Kaltenbach, Monog. d. Pflanzenläuse, p. 30, 1743. *Aphis* (orig. desc.).

Theobald, Jour. Econ. Biol., vol. 7, p. 77, 1913 (desc.).

Record.—*Taraxacum officinale*; California (Wilson).

H. F. Wilson stated to the author that he had taken this species on dandelion (*Taraxacum officinale*) in California, although he gave no date or locality record.

83. *Macrosiphum tulipae* (Monell)

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 19, 1879. *Siphonophora* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910 (list).

Records.—*Tulipa* sp.; Stanford University (Davidson); *Liriodendron* sp.; Berkeley, 1915 (Essig, Shinji).

This species is not known to the author. It has been found on tulips and on the tulip trees in the San Francisco Bay region by Davidson, Essig, and Shinji.

84. *Macrosiphum valerianae* (Clarke)

Clarke, Can. Ent., vol. 35, p. 253, 1903. *Nectarophora* (orig. desc.).

Record.—*Valeriana officinialis*; Berkeley (Clarke).

In 1903 Clarke described this species from specimens taken on heliotrope in Berkeley. Since then it has not again been found.

24. Genus *Myzus* Passerini

Passerini, Gli Afidi, 1860. Type *Aphis ribes* Linnaeus.

This genus is very closely related to *Rhopalosiphum* Koch, the principal difference being in the shape of the cornicles. However, some species fall easily into one or the other genus, depending entirely upon what form one has. In this respect *Rhopalosiphum persicae* (Sulz.) is particularly noticeable, the spring migrants having the clavate cornicles of *Rhopalosiphum*, the fall migrants having the cylindrical cornicles of *Myzus*. The author has followed Van der Goot in taking out of this genus *M. rosarum* (Walker) and placing it in the genus *Myzaphis* v.d.G. The antennal tubercles are lacking, thus placing the species in the Aphidini instead of the Macrosiphini. There are at present ten species of *Myzus* known to occur in California. Following is a key to them:

KEY TO THE CALIFORNIA SPECIES

Alate viviparous females

1. Secondary sensoria present on III only 5
- Secondary sensoria present on other segments as well as on III 2
2. Secondary sensoria on III, IV, and V 3
- Secondary sensoria on III and IV, none on V *fragaefolii* Cockerell
3. Cornicles dusky for entire length *cynosbati* (Oestlund)
- Cornicles mostly pale 4
4. Thoracic lobes distinctly darker than general body color, being black or dark brown *aquilegia* Essig
- Thoracic lobes at most only slightly darker than body, being a pale brown. *braggii* Gillette
5. Body black throughout *cerasi* (Fabricius)
- Body not black throughout 6
6. Cornicles pale except at extreme tip 7
- Cornicles with more than tip dusky 8
7. VI spur longer than III, the latter with but 9 to 12 sensoria. *varians* Davidson
- VI spur at most equal to III, the latter with 18 to 26 sensoria. *lycopersici* (Clarke)
8. Cornicles longer than either IV or V 10
- Cornicles not longer than either IV or V 9
9. VI spur longer than II *circumflexum* (Buckton)
- VI spur shorter than III *ribifolii* Davidson
10. III with 15 to 25 sensoria (fig. 178) *ramni* (Fonse.)
- III with but 9 to 12 sensoria *varians* Davidson

Apterous viviparous female

1. Body covered with capitate hairs 2
- Body not covered with capitate hairs except on head and antennae 5
2. Secondary sensoria on III 3
- No secondary sensoria on III 4
3. Cornicles dusky *ribifolii* Davidson
- Cornicles pale except tip *aquilegiae* Essig
4. Cornicles almost twice as long as III. Body fairly large sized. *braggii* Gillette
- Cornicles but slightly longer than III. Body small sized. *fragaefolii* Cockerell
5. Secondary sensoria on III 6
- No secondary sensoria on III 7
6. VI spur longer than III. Several sensoria scattered along the whole length of III *cynosbati* (Oestlund)
- VI spur at most equal to III. Only a few (1-3) sensoria at base of III. *lycopersici* (Clarke)
7. III longer than cornicles. Dorsum of abdomen with dusky markings, shaped somewhat as a horseshoe *circumflexum* (Buckton)
- III at most equal to cornicles. Abdomen not marked as above 8
8. Body black throughout *cerasi* (Fabricius)
- Body not black throughout 9
9. VI spur almost twice as long as III *varians* Davidson
- VI spur but slightly longer than III *ramni* (Fonse.)

85. *Myzus aquilegiae* Essig

Shinji, Can. Ent., vol. 40, p. 49, 1917. *Myzus* sp. (list).

Essig, Univ. Calif. Publ. Entom., vol. 1, p. 314, 1917 (orig. desc.).

Records.—*Aquilegia truncata*; Berkeley, 1916 (Essig); *A. vulgare*, Inverness, Marin County (Shinji).

This species was recently described by Essig from specimens found on columbine on the campus of the University of California, Berkeley. The author has had access to cotype specimens, although he has never collected it himself.

86. *Myzus braggii* Gillette

Figure 176

Gillette, Can. Ent., vol. 11, p. 17, 1908 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 409, 1912. *Phorodon carduinum* (Walker) (list).

Records.—*Cynara scolymus*; Courtland, Oakland, and San Jose (Davidson); Riverside, January and February, 1917.

The author found this species during the early spring of 1917 infesting the leaves of artichoke in Riverside. The determination of specimens was verified by C. P. Gillette. Davidson reported *Phorodon carduinum* (Walker) from artichoke in the San Francisco Bay region. His specimens were determined by J. Monell, but P. Van der Goot was doubtful as to its identity. Davidson himself has decided that the species is *Myzus braggii* Gillette. There is no doubt but that the species on artichoke in California is *M. braggii* Gillette, but whether or not this is the same as *P. carduinum* (Walker) is uncertain.

87. *Myzus cerasi* (Fabricius)

Figures 112, 121, 122, 179, 307

Fabricius, Syst. Nat., p. 734. *Aphis* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903 (list).

Gillette, Jour. Econ. Ent., vol. 1, p. 362, 1908 (desc.).

Newman, Mon. Bull. Calif. Comm. Hort., vol. 4, p. 446, 1915 (list).

Shinji, Can. Ent., vol. 49, p. 49, 1917 (list).

Records.—*Prunus cerasi*; Susanville, Lassen County (Newman); Berkeley, 1914, 1915, and 1916 (Essig, Shinji); Riverside, 1914 (Sharp); Fresno, June, 1915: *Prunus domestica*; Berkeley (Clarke).

The black cherry aphid is found occasionally throughout California, but seldom in large enough numbers to be injurious. It infests the terminal leaves of cherry, and sometimes other species of *Prunus*, causing them to curl to a certain extent. Eggs are laid in the late fall and early winter in the crevices of the bark and near the bases of the buds. These hatch the following spring about the time the buds are opening. The first few generations consist entirely of apterous females. In the early summer the alate females appear, and continue to do so in each succeeding generation until fall. In fact, after the first of July, or thereabouts, the majority of the lice produced are alate until the sexes appear in the fall. The first alate females taken by the author were on June 7, 1915. However, on April 25, 1916, Essig found a few alate females in Berkeley. In August, 1914, the apterae were also found in Berkeley.

Van der Goot makes this species out of the genus *Myzus*, using it as the type of his genus *Myzoides*. The author is inclined to follow him inasmuch as this is quite different from other members of this genus, approaching *Aphis* in its robust form and separated from that only by the length of the cornicles and presence of antennal tubercles. However, it has so long been considered as a species of *Myzus* that it is best to leave it so. It is not a good policy usually to form a new genus for one species, especially when it has for so long been considered as a member of another genus.

88. *Myzus circumflexus* (Buckton)

Figure 175

Buckton, Monog. Brit. Aphides, vol. 1, p. 130, 1875. *Siphonophora* (orig. desc.).

Gillette, Can. Ent., vol. 40, p. 19, 1908. *M. vincae*, n.sp. (desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 380, 1910. *M. vincae* Gill. (list).

Shinji, Can. Ent., vol. 49, p. 49, 1917 (list).

Record.—*Vinca major*; Stanford University (Davidson, Morrison), Berkeley, 1915 (Shinji), Los Angeles, March, 1917; *Aesculus californicus*, *Alopecurus pratensis*, *Asparagus*, spp., *Ceanothus* sp., *Cerastium viscosum*, *Cheiranthus chieri*, *Cyrtionium falcatum*, *Digitalis purpurea*, *Fuchsia* sp., *Gladiolus* sp., *Plantago* sp., *Senecio mikanioides*, *Sisymbrium* sp., *Solanum* spp., *Stachys bullata*, *Tropaeolum* sp., *Symphoricarpos racemosus*; Berkeley, 1915, 1916 (Essig, Shinji): *Viola tricolor*; Stanford University, March, 1915; Berkeley, 1915 (Essig, Shinji): *Richardia africana*; Pomona, 1909 (Essig); Stanford University, March, 1915; Berkeley, March, 1915 (Essig); San Diego, May, 1916; Los Angeles, March, 1917.

This very common aphid is found in the spring on a large variety of host plants throughout California. At times it may become so

abundant as to cause some considerable damage to its host. On March 4, 1917, the author observed it on periwinkle in Los Angeles in such numbers as to stunt the flowers and to cause all the plants to appear black and sticky. The apterae of this species are readily recognized by the black horseshoe-shaped marking on the dorsum of the abdomen.

89. *Myzus cynosbati* (Oestlund)

Oestlund, Minn. Geol. and Nat. Hist. Surv., Bull. 4, p. 81, 1887. *Nectarophora* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 10, p. 294, 1917 (note).

Shinji, Can. Ent., vol. 49, p. 49, 1917. *M. ribis* (Linn.) (list).

Records.—*Ribes vulgare*; Walnut Creek (Davidson); *Ribes glutinosum*, *R. menziesii*; Berkeley, April, 1915 (Shinji).

This species has been taken but a few times in the San Francisco Bay region; once on cultivated red currant in company with *Aphis neomexicana pacifica*, once on wild flowering currant, and once on wild canyon gooseberry. Furthermore, only the sexapura (migrants) and sexuales have been taken. Davidson writes that this is true *cynosbati* of Oestlund and not the species described by Davis (Ann. Ent. Soc. Am., vol. 2, p. 38, 1909), as *Macrosiphum cynosbati* (Oest.), which is not that species but some other. Shinji listed *M. ribis* (Linn.), but his specimens prove to be the sexuales of this species.

90. *Myzus fragaefolii* Cockerell

Figure 177

Cockerell, Can. Ent., vol. 33, p. 101, 1901 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 135, 1914 (desc. sexuales).

Records.—*Fragaria chiloensis*; Walnut Creek, Contra Costa County (Davidson); Berkeley, March to September, 1915; Palo Alto, April, 1915; Ontario, April, 1917; Buena Park, Orange County, May, 1917 (R. K. Bishop); Santa Barbara, May, 1917; Rialto, San Bernardino County, May, 1917 (A. B. Snow); *F. californicus*; Pine Hills, San Diego County, June, 1916.

On the under side of the leaves of native and cultivated strawberries this small yellowish aphid is often found, both in the San Francisco Bay region and in southern California. Seldom does it become abundant, although several records of its abundance were received from various parts of the south during the spring of 1917. Several growers have thought it bad enough to spray for it. During the late winter (January and February) the sexuales appear and the eggs are laid. These hatch in a short time, and during the rest of the year the alate and apterous viviparae are found.

91. *Myzus lycopersici* (Clarke)

Clarke, Can. Ent., vol. 35, p. 253, 1903. *Nectarophora* (orig. desc.).

Davis, Can. Ent., vol. 46, p. 123, 1914 (desc.).

Record.—*Lycopersicum esculentum*; Berkeley (Clarke).

Only once has this species been found in California. Davis in 1914 described a species from tomato in Idaho, Montana, and Oregon which he believed to be this one. It may be, and it may not be so. That can never be decided for the types of Clarke's species are all lost.

92. *Myzus rhamni* (Clarke)

Figure 178

Clarke, Can. Ent., vol. 35, p. 254, 1903. *Nectarophora* (orig. desc.).

Shinji, Can. Ent., vol. 49, p. 49, 1917. *M. rhamni* (Boyer) (list).

Records.—*Rhamnus californicus*; Berkeley (Clarke), Berkeley, March, 1915 (Shinji).

In March, 1915, George Shinji took a species of *Myzus* from coffee-berry in Berkeley. This fits Clarke's description of *Nectarophora rhamni*, in so far as the description goes. The author considers it to be the same species as described by Clarke, inasmuch as it was collected in the same locality and on the same host plant.

Wilson (Can. Ent., vol. 44, p. 156, 1912) describes a species from *Rhamnus purshiana* in Oregon as *M. rhamni* (Boyer), listing Clarke's species as a synonym. This is the same species as taken by Shinji in Berkeley, but it is doubtful if it is the species described by Boyer de Fonscolombe. Specimens in the author's collection from *Rhamnus* in Colorado are determined by Gillette and Bragg to be *Aphis rhamni* Fonsc. These are certainly different from the coast species, the former being an *Aphis* closely related to *A. euonomii* Fabr., the latter a *Myzus*. From this evidence the author cannot follow Wilson in placing *Nectarophora rhamni* Clarke as a synonym of *Aphis rhamni* Fonsc., considering both as *Myzus*, but he considers them as distinct, Clarke's species being a *Myzus*, Fonscolombe's an *Aphis*.

93. *Myzus ribifolii* Davidson

Davidson, Jour. Econ. Ent., vol. 10, p. 294, 1917 (orig. desc.).

Record.—*Ribes glutinosum*; Redwood Canyon, Contra Costa County (Davidson).

Davidson recently described all forms of this species from specimens taken during March, April, and May, 1913, 1914, and 1915, on wild flowering currant in Redwood Canyon, Contra Costa County. The author is unacquainted with the species.

94. *Myzus varians* Davidson

Davidson, Jour. Econ. Ent., vol. 5, p. 409, 1912 (orig. desc.).

Record.—*Clematis ligusticifolia*; San Jose (Davidson).

Davidson found this species on the under side of the leaves of wild clematis, or *Yerbade chivato*, near San Jose, and later in Walnut Creek, Contra Costa County. The author is unacquainted with the species.

25. Genus *Nectarosiphon* Schouteden

Schouteden, Aphidologische Notizen, Leipzig, 1901. Type *Macrosiphum rubicola* Oestlund, n.n. for *Macrosiphum* Oestlund, preoccupied.

KEY TO CALIFORNIA SPECIES

1. Body quite large, being about 3 to 4 mm. in length. Wings with dusky spot near tip *rubicola* (Oestlund)
- Body not so large, being only about 1.5 mm. long. Wings without dusky spot near tip *morrisoni* Swain

95. *Nectarosiphon rubicola* (Oestlund)

Figures 107, 109, 123

Oestlund, Minn. Geol. Nat. Hist. Surv., vol. 14, p. 27, 1886. *Macrosiphum* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 136, 1914. *Amphorophora* (list).

Records.—*Rubus nutkanus*; Contra Costa County (Davidson); Berkeley (Essig, Shinji).

This species is sometimes found infesting the tender leaves and shoots of thimbleberry in the San Francisco Bay region. The most distinctive character which readily separates it from *Amphorophora rubi* (Kalt.) is the presence of a dusky patch near the tip of the forewing. This was originally described by Oestlund as the type of his genus *Macrosiphum*. However, this name was preoccupied by *Macrosiphum* Passerini, so Schouteden proposed the name *Nectarosiphon* for this genus. Davidson listed this species as *Amphorophora*, and Morrison writes that he has never been able to satisfy himself why

this is not *Amphorophora* instead of *Nectarosiphon*. There is considerable difference in the antennal tubercles of this species and species of *Amphorophora*, although otherwise they are quite similar. The author believes that slight as the difference is it should be recognized for it is through the shape and size of the antennal tubercles that the different genera of the Macrosiphini are recognized in a large part. In this species the tubercles are large and distinct and neither gibbous nor toothed on the inner side, and with the outer side quite evident, while in *Amphorophora* they are small and distinctly toothed on the inner side, with the outer side a mere line, or not at all evident.

96. *Nectarosiphon morrisoni* Swain

Figures 124 to 127

Swain, Trans. Am. Ent. Soc., vol. 44, p. 8, 1918.

Records.—*Cupressus macrocarpa*; San Francisco (Compere, Morrison), San Diego (Swain); *C. guadalupensis*; San Diego (Swain).

In Golden Gate Park, San Francisco, and in Exposition Park, San Diego, this species has been taken on cypress. The small, slender, long-legged apterae are found infesting the terminal leaves of the host. Occasionally an alate female is seen. In San Diego, the apterae were found in company with *Cerosipha cupressi* Swain.

26. Genus *Pentalonia* Coquerel

Coquerel, Ann. Ent. Soc. France, vol. 7, p. 239, 1860. Type *P. nigronervosa* n.sp.

97. *Pentalonia nigronervosa* Coquerel

Coquerel, Ann. Ent. Soc. France, vol. 7, p. 239, 1860 (orig. desc.).

Wilson, Jour. Econ. Ent., vol. 2, p. 346, 1909 (desc.).

Record.—*Pelargonium* sp.; Stanford University (Morrison).

The following note concerning this species is from Morrison:

Pentalonia nigronervosa Coquerel. See Wilson, Jour. Econ. Ent., 1909. In the Davidson collection (belonging to Stanford University) there is a single glycerine jelly mount of this species. I have been able to see enough of it to be certain of its identity with that described by Wilson in the *Journal* (above). The record is from geranium, and Davidson once told me that he found it in alcohol in the laboratory [of Stanford University] at the time he began his study of the *Aphididae*. I believe the record should be published.

27. Genus **Phorodon** Passerini

Passerini, Gli Afidi, 1860. Type *P. humuli* Schr.

No attempt has been made to formulate a key to the California species of this genus, owing to the fact that the author has specimens of but one species, and that the description of the other is quite inadequate. Four species have been reported from this state, two of which prove to be species of other genera and one of which is very doubtful. *Phorodon carduinum* (Walker) as reported by Davidson, is *Myzus braggi* Gillette. *Phorodon galeopsidis* (Kaltenbach), also reported by Davidson, is *Rhopalosiphum hippophaeae* Koch. There is much diversity of opinion concerning the specific determination of these species and of *Myzus elaeagni* Del Guercio. One might refer to Gillette's paper on *Rhopalosiphum hippophaeae* Koch and *Myzus braggii* Gillette. Davis writes that he is not prepared to be quoted. Davidson lists *P. galeopsidis* and *R. hippophaeae* as synonyms. He states that his specimens listed as *P. carduinum* Walker were determined by Monell, but that Van der Goot is doubtful, while he himself believes them to be *M. braggii* Gillette. He has been followed in so listing them. This then leaves but two species reported from California.

98. **Phorodon humuli** (Schränk)

Figures 115 to 118

Schränk, Fauna Boica, vol. 2, p. 110, 1801-02. *Aphis* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903 (list).

Clarke, Calif. Agri. Exp. Sta., Bull. 160, 1904 (econ.).

Parker, U. S. Dept. Agri., Bull. 111, 1913 (econ.).

Vosler, Mon. Bull., Cal. Comm. Hort., vol. 2, p. 668, 1913 (list).

Records.—*Humulus* spp.; Berkeley (Clarke); Placer County (Vosler); Berkeley, July to September, 1915: *Prunus domestica*; Berkeley, March to April, 1915 (Essig, Shinji); (Parker).

This is the common hop plant louse found throughout the central part of the state. During the summer it is common on hops, but in the fall the sexupara migrate to plum, where the eggs are laid. These eggs hatch the following spring into stem mothers which feed on the opening buds of plum. During later generations, probably about the third or fourth, alate fundatrigeniae appear, which leave the plum and migrate to hop. Here the summer generations are produced until well into the fall. Parker states that the normal life cycle is as just stated, but that it is also possible, and it occasionally occurs, that this

aphid may live the entire year upon hops, or on plum, generation after generation of parthenogenetic females being produced.

99. *Phorodon scrophulariae* Thomas

Thomas, Ann. Rep. Ill. St. Ent., vol. 8, p. 72, 1879 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903 (list).

Record.—*Scrophularia* sp., Berkeley (Clarke).

This is a doubtful species, reported by Clarke as present on *Scrophularia* in Berkeley, and by Dr. Thomas in 1879 on a species of plant which he thought to be *Scrophularia* in Illinois. Since Clarke's record it has never been found, although Morrison states that he has spent considerable time examining the common *Scrophularia* plants in the vicinity of Stanford University, but to no avail. The author attempted to find it many times in the vicinity of San Diego during 1916, and in the vicinity of Riverside in 1917, with no success.

28. Genus *Rhopalosiphum* Koch

Koch, Die Pflanzenläuse, p. 23, 1854. Type *Aphis persicae* Sulz.

This genus is very closely related to *Myzus*, and is distinguished only by the shape of the cornicles. This distinction is variable, however, as in some species certain forms have the clavate cornicles of *Rhopalosiphum* while other forms have the cylindrical cornicles of *Myzus*. This is particularly true in the case of *Rhopalosiphum persicae* (Sulz.) and *Myzus braggii* Gillette. However, most aphidologists separate these two genera, so the author feels that it is best to do so.

KEY TO CALIFORNIA SPECIES

Alate viviparous females

1. Ground color dark (olive-green, wine, brown, and so forth) 2
- Ground color light, usually green (this does not refer to the dark markings on head, thorax, or abdomen, but rather to the ground color of the abdomen) 4
2. Wing veins with smoky borders and tips (fig. 164). IV with a few small sensoria *violae* Pergande
- Wing veins without smoky borders or tips, and IV without sensoria. *rhois* Monell
3. Antennae distinctly tuberculate, with sensoria on both III and IV (figs. 170, 279) 4
- Antennae not tuberculate, and IV without sensoria, or at most with but a few small ones (figs. 167, 168) 5

4. VI spur slightly longer than III (figs. 279, 281). Cornicles quite large and heavy (figs. 282, 284) **lactucae** (Kalt.)
 — VI spur about twice as long as III. Cornicles comparatively small and slender (fig. 165) **hippophoaes** Koch.
 5. First discoidal vein with distinct, smoky border, second discoidal bordered slightly so (fig. 166) **nervatum** Gillette
 — First and second discoidal without smoky borders 6
 6. Abdomen with dusky dorsal markings. III with a few (10–12) sensoria (fig. 168) **persicae** Sulz.
 — Abdomen without dusky dorsal markings. III with many (24–30) sensoria (fig. 167) **corylinum** Davidson

*Apterous viviparous females*¹²

1. Ground color dark (olive-green, wine, brown) 2
 — Ground color light (green, and so forth) 3
 2. Cornicles large and stout, longer than III **rhois** Monell
 — Cornicles smaller and more slender, shorter than III **violae** Pergande
 3. Cornicles longer than III 4
 — Cornicles shorter than III 5
 4. VI spur considerably longer than III, and subequal to cornicles. **nervatum** Gillette
 — VI spur about equal to III, and distinctly shorter than cornicles. **hippophoaes** Koch.
 5. III with secondary sensoria **lactucae** (Kalt.)
 — III with no secondary sensoria **persicae** (Sulz.)

100. **Rhopalosiphum corylinum** Davidson

Figure 167

Davidson, Jour. Econ. Ent., vol. 7, p. 134, 1914 (orig. desc.).

Records.—*Corylus rostrata*; Walnut Creek, Contra Costa County (Davidson):
Physocarpus capitatus; (Davidson).

This species was originally described from specimens of alate viviparae and pupae taken on wild hazelnut near Walnut Creek. Davidson writes that he has found it quite common on ninebark in the San Francisco Bay region. The author has never taken the species, but has had access to cotype specimens in Essig's collection.

101. **Rhopalosiphum hippophoaes** Koch

Figures 165, 170

Koch, Die Pflanzenläuse, p. 28, 1854 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 136, 1914. *Phorodon galeopsidis*
 Kalt. (list).

Gillette, Jour. Econ. Ent., vol. 8, p. 375, 1915 (synonymy).

Record.—*Polygonum* sp.; San Jose (Davidson).

¹² *R. corylinum* Dvdn. is omitted from this key as the apterous female was never described and specimens are not available to the author.

Davidson reported this species as present on knotweed in the vicinity of San Jose, under the name *P. galeopsidis* Kalt. Later he followed Gillette in placing it as a synonym of *R. hippophoaes* Koch. The author has never collected it, but has had access to specimens from Davidson in San Jose, and Davis in Oak Park, Illinois. For a full discussion of the synonymy of this species see Gillette's paper listed above.

102. *Rhopalosiphum lactucae* (Kalt.)

Figures 277 to 285

Kaltenbach, Monog. d. Pflanzenläuse, p. 37, 1843. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 277, 1910 (list).

Records.—*Sonchus* spp.; Stanford University (Davidson); Stanford University, May to July, 1915; Walnut Creek, May, 1915 (Davidson); Berkeley, July, 1915; Lemon Grove, San Diego County, January, 1916; Riverside, January to May, 1917; Los Angeles, April, 1917: *Asclepias* sp.; Corvallis, Oregon, November, 1913 (Moznette).

This is a common species infesting the heads of sow thistle throughout the San Francisco Bay region and southern California. In November, 1913, G. F. Moznette took it on milkweed in Corvallis, Oregon. This collection consisted entirely of alate females, that may have been the sexupara. Inasmuch as the identity of this species is doubtful there is given below a brief description drawn from specimens of nine alates and eight apterae taken on *Sonchus* spp. at Stanford University in May, 1915, in Walnut Creek in May, 1915, in Berkeley in July, 1915, and in Lemon Grove in January, 1916, and on *Asclepias* sp. in Corvallis, Oregon, in November, 1913. This latter collection is by George F. Moznette of Corvallis.

Alate viviparous female.—Prevailing color is apple green with the head dark green to black, the prothorax apple green, the thoracic lobes black. The abdomen is apple green with three pair of dusky marginal spots on segments one, two, and three, respectively, and with a larger dusky patch on the dorsum of segments four, five, and six, being between the cornicles. The cornicles and cauda are luteous with the extreme tip of the former dusky. The antennae are dusky throughout. The legs are luteous with the tarsi and tips of the femora and tibiae dusky.

The head is about twice as broad as long, with a distinct frontal tubercle (fig. 278). The antennae are set on distinct tubercles and are between one and one-fourth to one and one-half times as long

as the body. The relative lengths of the segments are as follows: the spur is the longest, being followed by III, which is subequal but never longer. IV is about one-half the length of the spur and slightly longer than V. II is slightly longer than VI, which is about equal to I. Sensoria are arranged as follows (figs. 279-281): on V and VI are the usual primary and accessory sensoria; on V in addition to the primary sensoria, there are at times as many as seven small circular secondary sensoria, located about the middle of the segment. The number of these sensoria range from none to seven, two and three being the usual number; on IV there are from six to twelve irregular secondary sensoria (fig. 280), placed irregularly along the whole length of the segment; on III there are between thirty and forty irregularly placed and irregularly sized sensoria (fig. 279) scattered along the whole length of the segment. The usual number is from thirty-six to thirty-nine. The prothorax is without lateral tubercles. The beak is of medium length, reaching to slightly beyond the second coxae. The cornicles (fig. 282) are fairly large and clavate on one side. At the widest point they are slightly less than one-fifth the length. The tip is slightly wider than the base. They are about the same length as the fourth antennal segment, although in some cases they may be slightly longer, and in others slightly shorter, but in all cases longer than the fifth antennal segment. The cauda (fig. 283) is long and fairly large, not quite reaching to the tip of the cornicles, being about one-half as long as the cornicles and one-half as long again as the hind tarsi. The wings and venation are normal, the forewings being about twice as long as the body.

Measurements: Body length, 1.48 to 1.87 mm.; width, 0.73 to 0.82 mm.; antennae total, 2.35 to 2.51 mm.; III, 0.544 to 0.697 mm.; IV, 0.306 to 0.425 mm.; V, 0.218 to 0.357 mm.; VI, 0.085 to 0.119 mm.; spur, 0.68 to 0.799 mm.; cornicles, 0.323 to 0.459 mm.; cauda, 0.187 to 0.255 mm.; hind tarsi, 0.136 to 0.153 mm.; wing length, 3.4 to 3.8 mm.; wing width, 1.2 to 1.5 mm.; wing expansion, 8.0 to 8.3 mm. The average measurements are as follows: body length, 1.74 mm.; width, 0.768 mm.; antennae total, 2.445 mm.; III, 0.645 mm.; IV, 0.382 mm.; V, 0.328 mm.; VI, 0.107 mm.; spur, 0.753 mm.; cornicles, 0.403 mm.; cauda, 0.248 mm.; hind tarsi, 0.139 mm.; wing length, 3.6 mm.; width, 1.32 mm.; expansion, 8.1.

Apterous viviparous female.—Prevailing color pale green with the head paler, being almost luteous or of a pale yellowish green color. The eyes are red. The antennae, except the apices of segments three

to six inclusive, the legs, except the tarsi and tips of the tibiae, the cauda, and the cornicles, except the tip, are all luteous. Sensoria are as follows: on V and VI the usual primary sensoria, on VI the accessory sensoria, and on III (fig. 278), from nine to eleven small, circular irregularly placed secondary sensoria. IV is without sensoria. The antennae are considerably longer than the body, the spur and III being subequal and the longest segments. Sometimes the spur is slightly longer than III. V is about one-half as long as III or the spur, and about four-fifths as long as IV. I and VI are subequal, being about one-seventh as long as the spur. The cornicles (fig. 284), are clavate, quite large, usually being slightly more than one-fifth the length of the body and over three times the length of the hind tarsi. The cauda (fig. 285) is long, sickle-shaped, and a little more than one-half as long as the cornicles.

Measurements: Body length, 1.7 to 2.18 mm.; width of abdomen, 0.82 to 1.73 mm.; antennae total, 2.32 to 2.48 mm.; III, 0.646 to 0.714 mm.; IV, 0.391 to 0.425 mm.; V, 0.323 to 0.34 mm.; VI, 0.102 mm.; spur, 0.646 to 0.782 mm.; cornicles, 0.459 to 0.493 mm.; cauda, 0.238 to 0.272 mm.; hind tarsi, 0.136 to 0.153 mm. The average measurements are as follows: body length, 1.87 mm.; width, 0.99 mm.; antennae total, 2.39 mm.; III, 0.674 mm.; IV, 0.408 mm.; V, 0.334 mm.; VI, 0.102 mm.; spur, 0.7099 mm.; cornicles, 0.473 mm.; cauda, 0.255 mm.; hind tarsi, 0.1445 mm.

103. *Rhopalosiphum nervatum* Gillette

Figures 166, 169, 171

Gillette, Can. Ent., vol. 40, p. 63, 1908 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 378, 1910. *R. arbuti*, n.sp. (desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 134, 1914 (list).

Records.—*Arbutus menziesii*; Stanford University, San Jose, Walnut Creek (Davidson); Sacramento (Essig); Stanford University, February to May, 1915; Berkeley, September, 1915: *Arbutus unedo*; Redlands, February, 1917; *Rosa* spp.; Walnut Creek (Davidson); Berkeley, February, 1915 (Essig).

In 1910 Davidson described a species of *Rhopalosiphum*, which he named *arbuti*, from specimens taken on madrone in the vicinity of Stanford University. Since then it has been found quite commonly on madrone throughout the San Francisco Bay region, and once on a strawberry tree in Silva Park, Redlands. It was noticed by the author that the alate females were very scarce at all times, although the apterae and nymphs were often quite abundant. Later, when

studying specimens while working up a key to the species of *Rhopalosiphum*, he found that structurally this species was identical with *Rhopalosiphum nervatum* Gillette. The latter had been taken on roses in the San Francisco Bay region. The identical structure and the scarcity of alates on madrone led to a belief that they were the same species. However, it was too late in the season (October, 1915) to try any transfer tests. No opportunity was found to try migration tests until in February, 1917, when the species was taken in Redlands. Two alate females were reared in the laboratory and then placed under a muslin bag on a rose bush, out of doors. A few days later these were examined and several young larvae observed. No further observations were made for two weeks, when it was found that the bag had been ripped off by the severe winds. Although this test was not a complete success the author feels confident of the identity of this species.

104. *Rhopalosiphum persicae*¹³ (Sulz.)

Figures 108, 119, 120, 168

Sulzer, Kan. Ins., p. 105, 1761. *Aphis* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903. *Rhopalosiphum dianthi* (Schrank) (list).

Gillette, Jour. Econ. Ent., vol. 1, p. 359, 1908. *Myzus* (desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 303, 1909. *R. dianthi* (Schrank), *R. achyranthes* Monell, and *Myzus* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *R. tulipae* Thomas (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 378, 1910. *R. dianthi* (Schr.) (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 379, 1910. *Myzus* (list).

Essig, Pom. Jour. Ent., vol. 3, p. 598, 1911. *Myzus* (desc.).

Records.—Throughout California by Clarke, Davidson, Essig, Ferris, Morrison, and the author on *Abutilon* sp., *Amaranthus retroflexus*, *Amsinckia respectabilis*, *Bougainvillea* sp., *Brassica* spp., *Capsella bursa-pastoris*, *Capsicum annuum*, *Catalpa* sp., *Chenopodium murale*, *Citrus* spp., *Cynoglossum grande*, *Cytisus proliferus*, *Geranium carolinianum*, *Hedera helix*, *Lycopersicum esculentum*, *Malva parviflorus*, *Oxalis oregana*, *Prunus* spp., *Ranunculus californicus*, *Raphanus sativus*, *Rumex* spp., *Sambucus glauca*, *Sanicula menziesii*, *Senecio vulgare*, *Solanum tuberosum*, *Sonchus* spp., *Tropaeolum* sp., *Tulipa* sp., *Vinca major*.

This green peach aphid is one of the most common aphids found in the state. It is most abundant in the spring, at which time it will be found on almost any plant. According to Gillette various species

¹³ George Shinji (Can. Ent., vol. 49, p. 49, 1917) recently described an aphid from specimens taken on *Godetia amaena* in Berkeley, which he named *Myzus godetiae* n.sp. The author has not seen specimens of this species, but from the description and figures, it is in all probability *Rhopalosiphum persicae* (Sulz.).

of *Prunus* are the winter hosts in Colorado, while during the summer it migrates to other plants. In California, however, winter eggs are not laid, the viviparous females living the year round. So far as the author has observed in over three years, only the form with clavate cornicles is found in California.

105. *Rhopalosiphum rhois* Monell

Figure 173

- Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 27, 1879 (orig. desc.).
 Davis, Can. Ent., vol. 46, p. 165, 1914. *R. howardi* (Wils.) (desc.).
 Essig, Univ. Calif. Publ. Ent., vol. 1, p. 330, 1917. *R. howardi* (Wils.) (list).
Ibid., p. 334, 1917 (list).

Records.—*Rhus diversiloba*; Berkeley, April, 1915; *Avena sativa*, Berkeley, (Essig).

This species has been taken in Berkeley on poison oak and grasses. Essig reported it recently as *R. howardi* (Wils.), but according to Gillette¹⁴ this is a synonym of *R. rhois* Monell, *Rhus* being the winter host, and various species of *Graminaceae* the summer hosts.

This species does not seem to be a typical *Rhopalosiphum*, being quite close to *Siphocoryne nymphaeae* Linn., but yet not fitting the generic description of *Siphocoryne* exactly. Consequently it is best to list it as has been done heretofore as *Rhopalosiphum*.

106. *Rhopalosiphum violae* Pergande

Figures 164, 174

- Pergande, Can. Ent., vol. 32, p. 29, 1900 (orig. desc.).
 Essig, Pom. Jour. Ent., vol. 1, p. 4, 1909 (desc.).
 Davidson, Jour. Econ. Ent., vol. 2, p. 303, 1909 (list).
 Davidson, Jour. Econ. Ent., vol. 3, p. 277, 1910 (list).

Records.—*Viola* spp.; Claremont, Santa Paula (Essig); Stanford University (Davidson); Palo Alto, May, 1915; Santa Ana, February, 1917; Riverside, April, 1917.

This beautiful little aphid is found more or less abundantly in the spring on the under side of the leaves of violets throughout the state. The dark red color and broad black wing veins serve to distinguish it readily from other aphids.

¹⁴ Gillette, Jour. Econ. Ent., vol. 8, p. 100, 1915.

Tribe **Aphidini** Wilson

Wilson, Ann. Ent. Soc. Am., vol., 3, p. 331, 1910.

Following is a brief characterization of this tribe, from Wilson:

The characters which separate this tribe from the previous one [Macrosiphini] are taken as follows: Antennae shorter than the body, or when as long as the body the cornicles and cauda are very short; antennal tubercles, when present, are indistinct, or else the cornicles and cauda are small; when the cornicles are very long or large the development is limited and the other characters are used to place the genera.

The California genera included by Wilson in this tribe are *Aphis*, *Cerosipha*, *Coloradoa*, *Hyalopterus*, *Liosomaphis*, and *Siphocoryne* [*Hyadaphis*]. In addition to these the author includes *Toxoptera* because of the small and indistinct antennal tubercles and the short cornicles, and *Myzaphis* because of the absence of antennal tubercles. The key to the California genera has been formulated by the author, following Wilson, Mordwilko, and Van der Goot.

1. Antennae five-segmented **Cerosipha** del Guercio
- Antennae six-segmented 2
2. Cornicles much shorter than cauda **Hyalopterus** Koch
- Cornicles about as long as or longer than cauda 3
3. Cornicles cylindrical, tapering, or conical, not distinctly clavate (fig. 182), except in *Coloradoa* and *Myzaphis*, in which they may be slightly clavate at the apex (fig. 315) 5
- Cornicles distinctly clavate (figs. 183, 184) 4
4. Cornicles long and strongly clavate on one side (fig. 184). Antennae shorter than body, with VI spur not longer than III **Liosomaphis** Walker
- Cornicles slender and but slightly clavate (fig. 183). Antennae never much shorter than body, with VI spur longer than III (fig. 258) or with a supra-caudal tubercle (figs. 255, 256) **Siphocoryne** Passerini
5. Third discoidal vein but one-branched (fig. 276). Body without lateral tubercles. Cauda long and prominent, being about as long as cornicles. **Toxoptera** Koch
- Third discoidal vein twice-branched. Body with or without lateral tubercles. Cauda usually distinctly shorter than cornicles 6
6. Front of head with a very distinct tubercle (figs. 308, 313). Body long without lateral tubercles. Cornicles long and often slightly swollen near apex **Myzaphis** Walker and **Coloradoa** Wilson
7. Front of head without prominent tubercle (fig. 233). Body more rounded with lateral tubercles on prothorax and seventh abdominal segment, and oftentimes on some of the anterior abdominal segments **Aphis** Linn.

29. Genus **Aphis** Linn.Linnaeus, Syst. Nat., 1748. Type *Aphis rumicis* Linn.

KEY TO CALIFORNIA SPECIES

Alate viviparous females

1. Abdomen with flocculent masses of wax. Antennae considerably shorter than body, and VI spur shorter than III **alamedensis** Clarke
- Abdomen without such flocculent masses of wax (except perhaps *Aphis cooki* Essig) 2
2. Antennae one and one-half times as long as the body, or more.
 - **houghtonensis** Throop
 - Antennae not so much longer than body; when longer, which is seldom, but slightly so 3
 3. Abdomen pale yellowish green. Found only on *Morus* sp. **mori** Clarke
 - Abdomen darker being black, dark green, yellow. Not found on *Morus* sp. 4
 4. Abdomen dark-green with an orange band between the cornicles.
 - **angelicae** Koch
 - Abdomen without such an orange band between the cornicles (sometimes there is a slight orange or reddish coloring between the cornicles of the apterae of *Aphis avenae* Fabr., but it is not constant) 5
 5. Abdomen sage-green with faint lateral spots. III with apical one-half conspicuously darkened and with six large sensoria. VI spur less than one-half as long as III. On *Atriplex* spp. **tetrapteralis** Cockerell
 - Not with above combination of characters 6
 6. IV with secondary sensoria (fig. 244) 7
 - IV without secondary sensoria (fig. 204) 27
 7. Cornicles and hind tarsi subequal 8
 - Cornicles considerably longer than hind tarsi 17
 8. VI spur shorter than III 9
 - VI spur equal to or longer than III 13
 9. Cornicles short and tapering 10
 - Cornicles short and incrassate **pseudobrassicae** Davis
 10. V with secondary sensoria. Body slightly pulverulent **cooki** Essig
 - V without secondary sensoria. Body not pulverulent 11
 11. Less than 12 secondary sensoria on III, arranged in a more or less even line 12
 - About 20 to 25 secondary sensoria on III, arranged irregularly along segment (fig. 244) **senecio** Swain
 12. III with 9 to 12 sensoria. V and VI base subequal, each being shorter than IV **lithospermi** Wilson
 - III with 5 to 9 sensoria. IV and V subequal, each being longer than VI base **viburnicolens** n.sp.
 13. Cornicles shorter than hind tarsi. A large black species in life being marked with white bars and cross bands on the abdomen **albipes** Oestlund
 - Cornicles and hind tarsi subequal. Body color greenish 14
 14. Root-infesting species. Antennae short, scarcely reaching the middle of the abdomen **middletonii** Thomas
 - Aërial species. Antennae reaching to base of the cornicles, or as long as body 15
 15. Cornicles incrassate. A medium-sized species **pseudobrassicae** Davis
 - Cornicles cylindrical and tapering slightly. A smaller-sized species 16

16. Cauda shorter than hind tarsi. III with 11 to 15 sensoria scattered irregularly along segment (fig. 294) *marutae* Oestlund
 — Cauda longer than hind tarsi. III with 5 to 9 more or less evenly arranged sensoria *viburnicolens* n.sp.
17. Cornicles equal to or longer than III 18
 — Cornicles not as long as III 19
18. Cauda, cornicles, and III subequal. Second branch of third discoidal vein very near to apex of wing *spiraecola* Patch
 — Cauda considerably shorter than cornicles or III, the last two being subequal. Second branch of third discoidal about midway between base of first branch and apex of wing *oenotherae* Oestlund
19. Fore wing with the second branch of the third discoidal arising very near to the apex of the wing. (In a few cases the second branch is not found, but never in both wings) (fig. 191) *avenae* Fabr.
 — Venation of fore wing normal (fig. 187) 20
20. Antennae longer than body *persicae-niger* Smith
 — Antennae not longer than body 20
21. A pair of small tubercles present on the middle of the seventh and eighth abdominal segments *malifoliae* Fitch
 — Such tubercles not present 22
22. V with secondary sensoria. VI spur longer than III 23
 — V without secondary sensoria. VI spur at most equal to III 25
23. Beak scarcely reaching second coxae *maidis* Fitch
 — Beak reaching beyond second coxae, even to or beyond the third 24
24. Cornicles longer than cauda (figs. 194, 195) and more than twice as long as hind tarsi *sambucifoliae* Fitch
 — Cornicles and cauda subequal; the former not more than twice as long as hind tarsi *neomexicana* Cockerell var. *pacifica* Davidson
25. Cauda and hind tarsi subequal. III with a few large sensoria (fig. 232). Abdomen green with dark dorsal markings *ramona* Swain
 — Cauda longer than hind tarsi. III with several sensoria. Abdomen black or dark brown 26
26. Cornicles more than twice as long as hind tarsi, often almost three times as long. VI spur and cornicles subequal, hind tarsi and VI base subequal. *hederae* Kalt.
 — Cornicles never more than twice as long as hind tarsi, usually considerably less. Hind tarsi usually slightly longer than VI base, and VI spur longer than cornicles *euonomi* Fabr.
27. Cornicles distinctly knobbed, the tip being widened to twice the width of the rest of the cornicles *frigidae* Oestlund
 — Cornicles normal 28
28. Fore wing with the second branch of the third discoidal arising very near the apex of the wing (fig. 188) *salicicola* Thomas
 — Fore wing with venation normal (fig. 187) 29
29. Cornicles distinctly longer than cauda 31
 — Cornicles at most equal to cauda 30
30. Cornicles short and swollen throughout apical one-half (fig. 203). Antennae as long as or longer than the body *brassicae* Linn.
 — Cornicles short and slender, and slightly clavate on one side. Antennae scarcely two-thirds as long as the body *atriplicis* Linn.
31. Abdomen without lateral tubercles on anterior segments. Cauda short and broad, with rounded tip, and almost as long as the cornicles *cardui* Linn.
 — Abdomen with lateral tubercles on at least one of the anterior segments 32

32. VI spur shorter than III	33
— VI spur not shorter than III	34
33. Cornicles about three times as long as cauda	<i>medicaginis</i> Koch
— Cornicles not three times as long as cauda	34
34. Cauda more than one-half as long as cornicles	35
— Cauda not more than one-half as long as cornicles	38
35. III with four or five fairly large sensoria	<i>oregonensis</i> Wilson
— III with many irregular sensoria	36
36. III with 20 or more sensoria, IV with none	37
— III with less than 20 sensoria, usually 14 or 15. IV usually with one or two, or more sensoria	<i>euonomi</i> Fabr.
37. IV about one-third longer than V. Cornicles about four times as long as broad at base. On <i>Heracleum</i> spp.	<i>heraclii</i> Cowen
— IV but about one-sixth longer than V. Cornicles about three times as long as broad at base. On <i>Yucca</i> sp.	<i>Yuccae</i> Cowen
38. A few (about 10) equal-sized sensoria on III (fig. 222). A large yellow species with distinct dark markings	<i>nerii</i> Fonse.
— About 20 irregular sensoria on III (fig. 211). Not yellow	39
39. Cornicles slightly more than twice as long as hind tarsi	40
— Cornicles not twice as long as hind tarsi	<i>cari</i> Essig
40. Hind tarsi slightly longer than cauda	<i>ceanothi</i> Clarke
— Hind tarsi shorter than cauda	<i>cornifoliae</i> Fitch
41. VI spur one and one-half or more times as long as III	<i>setariae</i> Thomas
— VI spur never so much longer than III	42
42. III with a few large circular sensoria (5-10) (figs. 226, 290)	43
— III with several (15 or more) irregular sensoria	45
43. Beak reaching to or beyond third coxae. IV never with sensoria.	<i>gossypii</i> Glover
— Beak not reaching third coxae	44
44. VI spur longer than III (fig. 226). Small size	<i>pomi</i> de Geer
— VI spur subequal to or shorter than III (figs. 289, 290). Medium to large size	<i>cerasifoliae</i> Fitch
45. Cornicles twice as long as cauda. Femora of all three pairs of legs similarly colored	<i>cari</i> Essig
— Cornicles longer than cauda, but not twice as long. Femora of first pair of legs pale, of second and third pair black	<i>euonomi</i> Fabr.

*Apterous viviparous females*¹⁵

1. Cornicles shorter than hind tarsi	2
— Cornicles equal to or longer than hind tarsi	4
2. VI spur longer than III. White bars and bands on abdomen in life.	<i>albipes</i> Oestlund
— VI spur not longer than III. Abdomen not as above	3
3. Cornicles and cauda subequal. Beak not reaching to second coxae. Pulverulent	<i>brassicae</i> Linn.
— Cornicles shorter than cauda. Beak reaching to or beyond second coxae. Not pulverulent	<i>atriplicis</i> Linn.

¹⁵ In this key only those species are included of which there are specimens in the author's collection or of which there are adequate descriptions available. The following species are therefore omitted: *Aphis alamedensis* Clarke, *A. houghtonensis* Throop, *A. mori* Clarke, *A. neomexicana* Cockerell, *A. oenotherae* Oestlund, and *A. tetrapteralis* Cockerell.

4. Cornicles and hind tarsi subequal	5
— Cornicles longer than hind tarsi	10
5. Secondary sensoria on III and IV. Root species	<i>middletonii</i> Thomas
— No secondary sensoria. Aërial species	6
6. III longer than VI spur	7
— III shorter than or at most equal to VI spur	8
7. IV and cornicles subequal	<i>lithospermi</i> Wilson
— IV shorter than cornicles. Pulverulent	<i>cooki</i> Essig
8. IV and cornicles subequal. Antennae considerably more than one-half the length of the body	9
— IV shorter than cornicles. Antennae at most one-half the length of the body.	<i>senecio</i> Swain
9. Cornicles twice as long as cauda and slightly swollen before the tip.	<i>avenae</i> Fabr.
— Cornicles not twice as long as cauda, cylindrical, and tapering toward tip.	<i>marutae</i> Oestlund
10. Cornicles less than twice as long as hind tarsi	11
— Cornicles twice as long as or longer than hind tarsi	21
11. Secondary sensoria on III and IV. Root-infesting species.	<i>middletonii</i> Thomas
— No secondary sensoria. Aërial species	12
12. VI spur longer than III	13
— VI spur at most equal to III	16
13. Ground color, black or dark brown	14
— Ground color, a shade of green	15
14. VI spur one and one-half to two times as long as III. Apex only of femora dusky	<i>setariae</i> Thomas
— VI spur but slightly longer than III. Apical one-half of femora dusky.	<i>medecaginis</i> Koch
15. Pale green. Cornicles and cauda subequal. Dark, mottled green. Cornicles twice as long as cauda or longer	<i>avenae</i> Fabr.
16. VI spur considerably shorter than III	17
— VI spur almost as long as III	18
17. Cornicles swollen toward tip	<i>pseudobrassicae</i> Davis
— Cornicles cylindrical and tapering toward tip	<i>ramona</i> Swain
18. Cornicles but slightly longer than hind tarsi	19
— Cornicles about one and one-half times as long as hind tarsi	20
19. Dark green. Cornicles at least three times as long as broad at base.	<i>maidis</i> Fitch
— Pale green. Cornicles at most twice as long as broad at base.	<i>senecio</i> Swain
20. Dark green to reddish yellow. On <i>Yucca</i> spp.	<i>yuccae</i> Cowen
— Black or very dark brown with black dorsal bands and spots. On various plants	<i>euonomi</i> Fabr.
21. Cornicles distinctly knobbed at tip	<i>frigidae</i> Oestlund
— Cornicles normal	22
22. VI spur longer than II	23
— VI spur at most equal to III	25
23. Pale green with dusky dorsal abdominal markings	<i>calendulicola</i> Monell
— Not colored as above, either not green, or if green with dusky dorsal abdominal markings	24

24. Bright yellow with black markings. Cornicles at least three times as long as hind tarsi.....	<i>nerii</i> Fonse.	
— Dark green with black markings. Cornicles but about twice as long as hind tarsi	<i>cardui</i> Linn.	
25. Cornicles longer than III		26
— Cornicles at most equal to III		29
26. III considerably longer than VI spur		27
— III subequal to or but slightly longer than VI spur		28
27. Black. Cornicles about three times as long as hind tarsi. III one and one half times as long as VI spur	<i>sambucifoliae</i> Fitch	
— Green, pale to apple. Cornicles about four times as long as hind tarsi. III almost twice as long as VI spur	<i>salicicola</i> Thomas	
28. Cornicles subequal to or but slightly longer than III, and about twice as long as cauda	<i>prunorum</i> Fabr.	
— Cornicles one and one-half to two times as long as III, and about four times as long as cauda	<i>oregonensis</i> Wilson	
29. Cornicles considerably shorter than III		30
— Cornicles subequal to or but slightly shorter than III		37
30. III and IV spur subequal	<i>persicae-niger</i> Smith	
— III longer than VI		31
31. Cornicles at least twice as long as cauda		36
— Cornicles not twice as long as cauda		32
32. Pale green, pulverulent	<i>cerasifoliae</i> Fitch	
— Dark green, brown, or black, not pulverulent		33
33. Cornicles about three times as long as hind tarsi		34
— Cornicles not three times as long as hind tarsi		35
34. III with a few small secondary sensoria	<i>hederae</i> Kalt.	
— No secondary sensoria	<i>cornifoliae</i> Fitch	
35. Cornicles considerably more than twice as long as hind tarsi. Lateral abdominal tubercles only on first and seventh segments	<i>heraclii</i> Cowen	
— Cornicles at most but slightly more than twice as long as hind tarsi. Lateral tubercles usually on more than first and seventh segments	<i>euonomi</i> Fabr.	
36. Antennae about as long as body. Cornicles more than twice as long as Cauda	<i>cari</i> Essig	
— Antennae but about one-half as long as body. Cornicles but about twice as long as cauda	<i>gossypii</i> Glover	
37. III considerably longer than VI spur		38
— III and VI spur subequal		40
38. A pair of dorsal abdominal tubercles on sixth and seventh segments.	<i>malifoliae</i> Fitch	
— No dorsal abdominal tubercles on sixth and seventh segments		39
39. Cornicles green, cylindrical, tapering slightly toward tip, and fairly straight. Cauda about one and one-half times as long as hind tarsi. Abdomen without dusky dorsal markings	<i>ramona</i> Swain	
— Cornicles black, cylindrical, curved outward. Cauda and hind tarsi subequal. Abdomen with dusky dorsal markings	<i>seanothi</i> Clarke	
40. VI spur slightly longer than III. Cornicles and cauda subequal.	<i>viburnicolens</i> n.sp.	
— VI spur slightly shorter than III. Cornicles one and one-half times as long as cauda	<i>pomi</i> De Gee	

107. *Aphis alamedensis* Clarke

Clarke, Can. Ent., vol. 35, p. 251, 1903 (orig. desc.).

Record.—*Prunus domestica*; Berkeley (Clarke).

This is an unknown species described from specimens taken by Clarke on greengage plum in Berkeley. Davidson suggests that it might be *Aphis cardui* Linn. (*pruni* Koch) from its brief description.

108. *Aphis albipes* Oestlund

Figures 198 to 200

Oestlund, Geol. Nat. Hist. Surv. Minn., Bull. 4, p. 52, 1887 (orig. desc.).

Williams, Univ. Neb. Studies, vol. 10, p. 119, 1910 (desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910 (list).

Records.—*Symphoricarpus racemosus*; Stanford University (Davidson); Congress Springs, Santa Clara County, July, 1915 (McCracken); Berkeley, July, 1915 (Shinji).

This species is found at times curling the leaves of snowberry in the San Francisco Bay region. Dr. McCracken noted in connection with the infestation at Congress Springs, "they are quite prettily patterned with white bars and cross-bars." This is usually enough to distinguish them.

109. *Aphis angelicae* Koch.

Koch, Die Pflanzenläuse, p. 521, 1854 (orig. desc.).

Wilson, Jour. Econ. Ent., vol. 2, p. 348, 1909 (desc.).

Record.—*Angelica* sp., *Hedera* sp.; California (Wilson).

Wilson reported this species from California, but gave no locality or date. It is unknown to the author.

110. *Aphis atriplicis* Linn.

Linnaeus, Fauna Sweden, p. 1000, 1761 (orig. desc.).

Hayhurst, Ann. Ent. Soc. Am., vol. 2, pp. 88-100, 1909 (desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 407, 1912 (desc. sexuales apterous viviparae).

Davidson, Jour. Econ. Ent., vol. 7, p. 133, 1914 (desc. fundatrix).

Records.—*Chenopodium album*, *C. murale*; San Jose, Walnut Creek (Davidson).

This has been reported twice from pigweed or goosefoot in the San Francisco Bay region, where Davidson states that it is very common. The sexes occur in October. Davidson believes that there is an alternate host, but as to what it might be, he is uncertain. The author has never collected specimens, but has had access to material taken by R. W. Doane on *Chenopodium* in Utah in August, 1916.

111. *Aphis avenae* Fabr.

Figures 191, 201, 202

Fabricius, Ent. Syst., p. 736, 1775 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 254, 1903. *Nectarophora* (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *Siphocoryne* (list).

Essig, Pom. Jour. Ent., vol. 3, p. 465, 1911. *A. padi* Linn. (list).

Essig, Pom. Jour. Ent., vol. 4, p. 790, 1912. *A. maidis* Fitch (desc.).

Smith, Mon. Bull. Cal. Comm. Hort., vol. 3, p. 116, 1914 (list).

Davidson, Mon. Bull. Cal. Comm. Hort., vol. 6, p. 65, 1917 (note).

Records.—*Graminaceae* (various spp.); California, December to May (Davidson, Essig, Morrison, author): *Phalaris arundinacea*; Stanford University, May to July, 1915: *Dracaena draco*; Stanford University, June, 1915: *Musa sapientum*; San Diego, March, 1916: *Typha latifolia*; (Davidson).

This is an abundant species through the state, occurring during the late winter and spring on grasses and grains, migrating to other hosts as these become ripened and dried.

The life history of this species, according to Davis (U. S. Dept. Agr., Bull. 111, April, 1914), is somewhat as follows:

The spring colonies on grains and grasses originate from viviparous females which passed the winter on the grains and grasses, or from spring migrants from the apples or related fruits; i.e., the progeny of the aphids hatching from eggs laid the previous fall on such trees. As the weather becomes cooler they seek the lower parts or the roots of wheat and other plants of the grass family, and here pass the winter as viviparous females; or the winged fall migrants from the grain may seek such trees as the apple, where the true sexes are produced.

Undoubtedly the most common method of wintering over in California is on the roots and lower parts of the grains and grasses. This species has never been collected on apples or other related trees in this state, nor have the eggs ever been observed. During the early spring it is found abundantly on the grains and small grasses, in January and February in the southern part of the state, and during April and May in the central part. As the grains ripen and the stalks and leaves become hardened, it seems that the aphids migrate to other varieties of grass which remain soft and green later, as canary grass and reed grass and corn, or even to such hosts as the

dragon tree, cat-tail rush, and the banana. But the winter is spent as viviparous females on the grains and grasses.

This species has been confused many times with other species infesting grains, such as *Macrosiphum granarium* (Kirby) and *Toxoptera graminum* (Rond.). As the latter does not occur in this state it cannot be confused here with *Aphis avenae* Fabr. Clarke listed this as *Nectarophora avenae* Fabr., so it appears that he might have had *Macrosiphum granarium* (Kirby) in mind, as it is highly improbable that he could have confused *Aphis avenae* Fabr. with a species of *Macrosiphum* (*Nectarophora*). The cornicles of *avenae* Fabr., the absence of antennal tubercles, and the irregular venation make it quite easily distinguishable. The cornicles are quite short, as compared with a species of *Macrosiphum*, and distinct antennal tubercles are entirely lacking. The third discoidal vein of the forewing is typically twice-branched, but the second is close to the apex of the wing, and sometimes is entirely lacking. The only other species of *Aphis* in this state with this character is *Aphis salicicola* Thomas, found on willows. These two are readily distinguished from each other by the comparative lengths of the cornicles, which are considerably longer in *salicicola* Thomas than in *avenae* Fabr.

112. *Aphis brassicae* Linnaeus

Figures 203, 204

Linnaeus, Syst. Nat., vol. 2, p. 734, 1735 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 250, 1903 (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910 (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 399, 1911 (list).

Essig, Pom. Jour. Ent., vol. 3, p. 523, 1911 (desc.).

Record.—*Cruciferae* (various spp.); throughout California.

During the late winter and spring cruciferous plants are often heavily infested with this species. Of the cultivated plants cabbages and radishes seem to be most heavily infested; while the wild mustard and radish often have the entire flower clusters covered with these aphids. Oftentimes in the colonies of this species are also found *Aphis pseudobrassicae* Davis, *Rhopalosiphum lactucae* (Kalt.), and *R. persicae* (Sulz.). In southern California the colonies are always attacked by the braconid fly, *Diaretus rapae* Curtiss, and a large percentage of the individuals destroyed. As summer comes on these parasites and such predators as syrphids and ladybirds usually get the best of the aphids, which disappear to a large extent until fall.

113. *Aphis calendulicola* Monell

Monell, U. S. Geol. Geog. Surv., Bull. 5, p. 23, 1879 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 250, 1903 (list).

Record.—*Calendula officinale*; Berkeley (Clarke).

This species has not been recognized since Clarke's report of it on marigold. It is possible that he had *Aphis senecio* Swain, which is very common on marigolds throughout the state.

114. *Aphis cardui* Linn.

Figures 208, 209

Linnaeus, Syst. Nat., vol. 2, p. 735, 1735 (orig. desc.).

Carnes, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 399, 1912. *Aphis pruni* (list).

Davidson, Jour. Econ. Ent., vol. 5, p. 407, 1912 (list).

Patch, Maine Agr. Exp. Sta., Bull. 233, p. 263, 1914 (desc.).

Records.—*Cirsium* sp.; San Jose (Davidson); Berkeley, June, 1915: *Prunus domestica*; Orangevale, Sacramento County (Carnes); Walnut Creek (Davidson); Berkeley, March, 1916 (Essig).

According to Patch this thistle aphid is the same as the one infesting plums and formerly known as *A. pruni* Koch. Both are abundant in the San Francisco Bay region, *pruni* being found in the fall and spring on plum, *cardui* during the summer on thistle. The author has attempted no transfer tests, so accepts Patch's statement as authority for the synonymy. It is certain that structurally these are strictly identical.

115. *Aphis cari* Essig

Essig, Univ. Calif. Publ. Entom., vol. 1, pp. 317-321, 1917 (orig. desc.).

Record.—*Carum kelloggii*; Rutherford, Napa County (Essig); *Angelica tomentosa*; Berkeley (Essig).

Essig recently described this from specimens taken on wild anise in Rutherford. The author has seen cotype specimens, but has never collected the species.

116. *Aphis ceanothi* Clarke

Figures 210, 211

Clarke, Can. Ent., vol. 35, p. 250, 1903 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910 (list).

Essig, Pom. Jour. Ent., vol. 3, p. 525, 1911. *Aphis ceanothi-hirsuti* n. sp. (desc.).

Records.—*Ceanothus integerrimus*; Colfax, Placer County (Clarke); Witch Creek, San Diego County, June, 1916: *C. cuneatus*; Stanford University (Davidson), November, 1910 (Morrison), October, 1915 (R. A. Vickerey): *C. thysiflorus*; Bear Creek Gulch, Santa Clara County, April, 1911 (Morrison): *C. hirsuti*; Santa Paula (Essig).

This is a widely distributed species, having been found on *Ceanothus* as far north as Placer County, and as far south as San Diego County. It is seldom abundant, however. The species that Essig described as *A. ceanothi-hirsuti* n.sp. is undoubtedly the same as Clarke described.

117. *Aphis cerasifoliae* Fitch

Figures 288 to 292

Fitch, Rept. Ins. N. Y., vol. 1, p. 131, 1855 (orig. desc.).

Patch, Maine Agr. Exp. Sta., Bull. 233, p. 260, 1914 (desc.).

Record.—*Prunus emarginata*; Wynola, San Diego County, June, 1916.

This aphid was found abundantly curling the terminal leaves of wild cherry near Wynola (3700 feet altitude), San Diego County, in June, 1916. Alate and apterous viviparous females as well as nymphs were abundant in the curled leaves. The apterae and nymphs were slightly pulverulent. This species corresponds very closely to *Aphis cerasifoliae* Fitch as described by Patch (*op. cit.*), although there are some minor differences. Following is a copy of Patch's description of the Maine specimens of this species:

This well defined species is common on both the native choke cherry, *Prunus virginiana*, and the western *P. demissa* Walp. introduced in a nursery row on our campus.

Apterous female.—Head, pale green or water whitish, beak short, extending to second coxae, eyes, antennae with I, II and III concolorous with head, distal half darker to black, III with no sensoria, proportions as shown in figure; prothorax pale green, lateral tubercles present; thorax green with dark green mid-dorsal line, femora and tibiae pale and tarsi black; abdomen pulverulent, pale green with dark green median line and dark green transverse lines between segments, lateral tubercles present, cornicles pale with dusky tips, slender, slightly tapering, and approximately twice the tarsus in length, cauda white with dark tip; conical, being broad at base and abruptly tapering.

Nymphs and pupae are also pulverulent and have dark green middorsal and transverse intersegmental line, though these are not always well defined in the pupa which has two lateral dark green lines on thorax.

Alate female. Head black, beak short, not reaching to second coxae, eyes black, antennae dark, III with from about 12 to 18 large sensoria about the size of the terminal one on V, IV with from none to several sensoria like those on III, proportions of joints as shown in the figure; prothorax green with black transverse band, lateral tubercles present; thorax black, wings iridescent with slender brown veins and large dusky stigma with pointed tip; commonly though not

always with second branch very short, abdomen glabrous, rather bright though not vivid green, median line dark green, sutural lines dark green ending in marginal green dots, cornicles dark, cauda green.

Aphis cerasifoliae is gregarious on the ventral surface of the terminal leaves badly curling and deforming them. A copious amount of honeydew is present, and ants are usually found attending a colony of this species.

The specimens from Wynola agree very well with this description, although as stated above, there are a few minor points of difference. However, as Dr. Patch writes: "It seems too close to *cerasifoliae* to give it a distinct name," and "if the appearance *in life* answers my description of *cerasifoliae* I should be inclined to call it that. It happens to be a species as characteristic alive as dead." Following are the notes the author took of its appearance alive, before he suspected its identity: "Alates, apterae and nymphs abundant on terminal leaves curling them badly. Large amount of honeydew and many ants in attendance. Apterae and nymphs pulverulent." These notes agree exactly with Patch's notes, cited above.

Following is a brief description of specimens taken at Wynola on July 8:

Apterous viviparous female.—Prevailing color pale apple green, pulverulent. Head luteous. Thorax and abdomen pale green with middorsal longitudinal stripe darker green. Antennae with the three basal joints luteous, the three apical joints shading into black. Primary sensoria on V and VI, accessory sensoria on VI, no secondary sensoria. III and spur are subequal, or III slightly the longer. IV and V subequal and a little more than one-half as long as III. In some cases IV is slightly longer than V. VI is about one-fourth as long as its spur, longer than I, which in turn is longer than II. The antennae are longer than the body. Cornicles long, slightly tapering, pale with tip dusky, about equal in length to the fifth antennal segment and about twice the length of the hind tarsus. Cauda long, conical, and about two-thirds the length of the cornicles, pale with tip dusky. Lateral tubercles are present on the first and seventh abdominal segments and on one other of the abdominal segments, in some cases on the second, in others on the third, and in others on the fourth.

Measurements (of specimens mounted in Canadian balsam): Body length, 1.5 to 1.53 mm.; body width (abdomen), 0.247 mm.; antennae total, 1.445 to 1.734 mm. (av. 1.6082 mm.); I, 0.085 to 0.117 mm. (av. 0.0987 mm.); II, 0.068 mm.; III, 0.408 to 0.467 mm. (av. 0.4335 mm.); IV, 0.238 to 0.306 mm. (av. 0.272 mm.); V, 0.221 to 0.233 mm. (av. 0.224 mm.); VI, 0.1105 to 0.119 mm. (av. 0.1169 mm.); spur,

0.408 to 0.45 mm. (av. 0.4186 mm.); cornicles, 0.221 to 0.255 mm. (av. 0.2401 mm.); cauda, 0.15 mm.; hind tarsi, 0.12 to 0.135 mm. (av. 0.1275 mm.).

Alate viviparous female.—Prevailing color pale to apple green. Head, antennae, thorax, marginal spots on abdomen, cornicles, tip of cauda, femora, and tarsi all black. Antennae (fig. 289, 290) with the usual primary sensoria on V and VI and the usual accessory sensoria on VI. IV without sensoria and III with from 6 to 11 fairly large circular secondary sensoria, the usual number being 8 (fig. 290). In this character it differs most markedly from the Maine specimens, which have from 12 to 18 sensoria on III and from none to several on IV. The antennae are slightly shorter than the body although practically of the same length. III is the longest segment, closely followed by the spur, then by IV, V, VI, I and II. III and the spur are subequal, or either one or the other may be slightly the longer. In Patch's drawing V is a little longer than IV. In the California specimen IV is always slightly the longer of the two. In all the California specimens the antennal segments are all a little shorter than in the Maine material. Lateral tubercles are present on the prothorax; they are always present on the seventh abdominal segment, and may be present on any of the first few segments of the abdomen as well. In one case they were observed on the second and seventh segments, in another on the second, third, and seventh, in still another on the fourth, fifth, and seventh, and in a fourth case on the first, second, third, fourth, and seventh segments (fig. 292). The wings and venation are normal, with the second branch of the cubitus arising nearer to the tip of the wing than to the base of the first branch (fig. 291). However, it is not quite so close to the wing tip as in the Maine specimens. The cornicles (fig. 292) are long and cylindrical. They are equal to or slightly shorter than V, and from one and one-half to two times as long as the hind tarsi. The cauda (fig. 292) is more or less ensiform, about one-half as long as the cornicles, reaching to the tip of the cornicles, and subequal to or slightly shorter than the hind tarsi.

Measurements (of specimens mounted in Canadian balsam): Body length, 1.53 to 1.65 mm. (av. 1.585 mm.); width of thorax 0.697 to 0.765 mm. (av. 0.731 mm.), antennae total, 1.568 mm.; I, 0.068 to 0.085 mm. (av. 0.0765 mm.); II, 0.051 mm.; III, 0.331 to 0.408 mm. (av. 0.3644 mm.); IV, 0.238 to 0.289 mm. (av. 0.2817 mm.); V, 0.221 to 0.247 mm. (av. 0.2295 mm.); VI base, 0.085 to 0.111 mm. (av.

0.1015 mm.); VI spur, 0.391 mm.; cornicles, 0.204 to 0.246 mm. (av. 0.2179 mm.); cauda, 0.103 to 0.119 mm. (av. 0.1084 mm.); hind tarsi, 0.136 mm.

118. *Aphis cooki* Essig

Figures 212 to 214

Essig, Pom. Jour. Ent., vol. 2, p. 323, 1910. *Aphis gossypii* Glover (desc.).

Essig, Pom. Jour. Ent., vol. 3, p. 587, 1911 (orig. desc.).

Record.—*Citrus* sp., Pomona (Essig).

In 1909, C. H. Vary, county horticultural inspector in Pomona, found a few orange trees heavily infested with this aphid. Prompt control measures were taken and since then it has never again been observed. Essig first thought it to be *Aphis gossypii* Glover and described it under that name. Later, however, he found it to be an undescribed species, so named it *Aphis cooki* n.sp. after Dr. A. J. Cook.

119. *Aphis cornifoliae* Fitch

Fitch, Cat. Homop. N. Y., p. 65, 1851 (orig. desc.).

Records.—*Cornus pubescens*, *Sanicula menziesii*; San Francisco Bay region (Davidson).

A species comparing very favorably with this has been taken by Davidson a number of times in the San Francisco Bay region. The fall and winter is spent on dogwood, the summer on gambleweed. Davidson writes as follows:

This aphid [from *Sanicula*] certainly appears to be very close to what I have called (after Gillette) *cornifoliae*. Moreover, I have noticed that the two plants, dogwood and *Sanicula*, frequently grow near each other and that there appeared to be a migration of alates from the former just about the time there was a migration of the alates to the latter.

This migration took place the latter part of April in 1916.

120. *Aphis crataegifolii* Fitch

Fitch, Cat. Homop. N. Y., p. 66, 1851 (orig. desc.).

Sanborn, Kan. Univ. Sci. Bull. 3, p. 53, 1904 (desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910 (list).

Record.—*Crataegus oxycantha*; San Jose, Palo Alto (Davidson).

This has been reported more or less abundant on hawthorne in the San Francisco Bay region. According to A. C. Baker this is a good and distinct species and not a synonym of *Aphis pomi* De Geer, as formerly believed.

121. *Aphis euonomi* Fabr.

Figures 182, 187, 190, 205 to 207, 236, 237

Fabricius, Syst. Ent., p. 736, 1794 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909. *A. rumicis* Linn. (list, in part?).Essig, Mon. Bull. Cal. Comm. Hort., vol. 4, p. 446, 1915. *A. rumicis* Linn. (list).

Records—*Althaea rosea*, Berkeley, June, 1915; *Hisbiscus moscheutos*, Berkeley, July, 1915; *Maytenus boaria*, Berkeley, July, 1915; *Mesembryanthemum equilaterale*, Stanford University, June, 1915; *Silybum marianum*, Stanford University, July, 1915; *Urtica holoserica*, Menlo Park, San Mateo County, January, 1915; *Calendula officinale*, Orange, February, 1917; *Anthemis* sp., Pasadena, April, 1917; *Papaver* sp., El Cajon, San Diego County, May, 1916 (*Aphis papaveris* Fabr.?); *Vicia faba*, Stanford University (Davidson), Oxnard (Essig, 1915), Montebello, Los Angeles County, December, 1916, Riverside, January to May 1917 (*Aphis fabae* Scop.?); *Rumex* spp., Palo Alto, January, 1912 (Davidson), Stanford University, March, 1912 (Morrison), March, 1915, Ventura County, May, 1917; *Phaseolus* spp., Ventura County, May, 1917 (*Aphis rumicis* Linn.?).

There has been a great deal of confusion regarding the identity of this species of aphid, and as yet its synonymy is not worked out satisfactorily. The following is offered only provisionally by the author. The common black aphid has usually been considered as *Aphis rumicis* Linn., *Aphis euonomi* Fabr. being taken as a synonym, but according to Gillette, Linnaeus' description calls for an aphid "brassy brown in color, and not black according to the popular opinion; and its food plant should be species of *Rumex*." He considers the common black species to be *Aphis euonomi* Fabr., as does Mordwilko in the European form. The author follows these two aphidologists in placing *Aphis rumicis* Linn. of American authors (and later European authors) as a synonym of *Aphis euonomi* Fabr. He (i.e., Gillette) writes, "whether or not it is synonymous with *rumicis* we are not certain, but we very much doubt this being the case." As long ago as 1894, Osborn and Serrine (Iowa Agr. Sta., Bull. 26, p. 904, 1894) proved that the species which wintered in Iowa on *Euonymus* migrated to *Rumex* and other plants in the summer. In California the author has been unable to find it at any time upon *Euonymus*, although this is a very common ornamental plant, especially in the vicinity of Riverside. This may be due, however, to the mild winter climate of southern California, which permits plant lice to live throughout the winter, thus not necessitating the laying of eggs. Concerning the identity of the California species the author believes the form described briefly below to be *Aphis euonomi* Fabr. The

one following is probably the same species, and is the one described as *Aphis papaveris* by Fabricius. The species from *Vicia faba* is probably the species described as *Aphis fabae* Scop., which may be synonymous with *Aphis euonomi* Fabr., but again may not be. The author tried a few transfer tests this spring (1917) with the form from *Vicia*, attempting to colonize it on *Hedera helix* and on *Rumex* spp., with negative results. Of course, this does not prove that it will not colonize on these plants, although the author has come to the conclusion that the *Hedera* species is entirely different, being *Aphis hederæ* Kalt. Dr. Patch¹⁶ in her interesting paper on aphid ecology makes the following statement regarding migration tests, which, it seems to the author, it is well to remember when making such tests:

If an investigator fails in one hundred attempts to colonize thistle with migrants from plum, that will not be a safe reason for him to conclude that he is not working with *Aphis cardui*, or that this thistle aphid has nothing to do with the leaf deformations of the plum in the spring. It has been my experience that negative data with aphids under such conditions are just no data at all. If the structural characters are such as warrant the migration test in the first place, they warrant a patient continuation even in the face of repeated failures.

On the other hand (and this is a most encouraging and stimulating circumstance in connection with aphid migration tests), a single success goes a long way to prove the case. Barring complications, a single success is enough, and repetitions and verifications are needed only as safeguards in that respect.

The third description is from specimens taken on *Rumex* spp. and although slightly different from the one considered as *Aphis euonomi* Fabr., it may be the same, and it may be *Aphis rumicis* Linn., but of this the author is doubtful.

In the bean fields of Ventura County, this black bean aphid is very abundant, and often does considerable damage. In May, 1917, the bean plants were just beginning to appear, and as yet were not infested with the aphid. However, the native dock was quite heavily infested. It seems that the aphid lives over the winter on dock and perhaps on other native plants, migrating in the early summer to the beans. Here it lives throughout the summer, returning to dock when the beans have been harvested and the plants plowed under. Horticultural Commissioner A. A. Brock, of Ventura County, places great hope in the efficiency of *Hippodamia convergens* Guérin as a controlling factor. In the spring of 1917 he collected a vast number of these ladybird beetles in Sespe Canyon and turned them loose in the bean fields just as the aphids were beginning to appear. At the present time the results are unknown.

¹⁶ Patch, Edith M., Concerning problems in Aphid ecology, Jour. Econ. Ent., vol. 9, pp. 44-51, 1917.

The following brief description was made from specimens collected from the first six host plants listed above, and is the one considered as *Aphis euonomi* Fabr.

Alate viviparous female.—Color apparently black, but on close examination it seems that the ground color is a very dark brown, covered with a blackish tinge, with the following parts decidedly black: head, antennae, thoracic lobes, marginal spots and transverse bands on the abdomen, cornicles, tarsi, coxae, tips of tibiae, and apical one-half to two-thirds of the middle and hind femora. The tibiae and fore femora are pale, appearing whitish in life. The antennae are shorter than the body, III being the longest segment, followed closely by VI spur. In one case VI spur was slightly longer than III and in another equal to III. In all other specimens III was the longer segment. IV and V are subequal, V usually being slightly the shorter. There are from eleven to twenty-one secondary sensoria on III, of irregular size. These are scattered along the whole length of the segment, the distal five or six being in a more or less even line. The usual number is about twelve to fourteen. The number of secondary sensoria on IV range from none to seven, the modal number being two. In one specimen only were sensoria absent from IV; in another, one antenna had seven, the other having two, while in a third, one antenna had five, the other six. When there are more than two or three sensoria, they are all quite small, and can be clearly distinguished only by the higher power of a microscope. Two is the usual number, being located about the middle of the segment. V is usually without secondary sensoria, the primary sensorium being always present, however. In one specimen the antennae had one or two very small secondary sensoria on V, and in another specimen one antenna had one small sensorium, the other none. The usual primary and accessory sensoria are present on VI base. Lateral abdominal tubercles are always present on the seventh segment, usually on the first, and often on the second, third, fourth, or fifth. There are always at least three pair of these tubercles, and oftentimes more. One specimen had tubercles on the first, second, third, fourth, and seventh segments. The cornicles are black, imbricated, and taper noticeably from base to apex. They are quite constant in length, the variation being not more than 0.05 mm. in all the specimens examined. They are about half as long again as the hind tarsi. The cauda is concolorous with the abdomen, short and conical or ensiform, and subequal in length to the hind tarsi. The wings are normal, with the typical *Aphis* venation.

Measurements: Body length, 1.53 to 1.989 mm. (av. 1.74 mm.); width of thorax, 0.68 to 0.918 mm. (av. 0.765 mm.); antennae total, 1.122 to 1.36 mm. (av. 1.272 mm.); III, 0.289 to 0.425 mm. (av. 0.3648 mm.); IV, 0.1955 to 0.272 mm. (av. 0.2266 mm.); V, 0.187 to 0.221 mm. (av. 0.1885 mm.); VI, base 0.102 to 0.136 mm. (av. 0.1119 mm.); VI, spur 0.289 to 0.357 mm. (av. 0.3145 mm.); cornicles, 0.1785 to 0.221 mm. (av. 0.2118 mm.); cauda, 0.136 to 0.162 mm. (av. 0.14875 mm.); hind tarsus, 0.136 to 0.152 mm. (av. 0.1372 mm.).

Specimens taken by the author in May, 1916, on *Papaver* sp. (cultivated poppy) near El Cajon, San Diego County, seem to him to be *Aphis papaveris* Fabr. (Genera Insectorum, p. 303, 1717), and probably are the same as the above species, although they may be different. There are from thirteen to fifteen irregular secondary sensoria on III as above, but IV and V are without secondary sensoria, with one exception, in which there was one small sensorium near the middle of IV. The cauda is equal to the hind tarsi, the cornicles being longer, and about the same comparative length as above. The third antennal segment appears to be longer in comparison than above in some specimens. Lateral abdominal tubercles are present on the first, third, and seventh abdominal segments.

Measurements: Body length, 1.486 to 1.908 mm. (av. 1.711 mm.); width of thorax, 0.595 to 0.765 mm. (av. 0.68 mm.); antennae total, 1.224 to 1.343 mm. (av. 1.2878 mm.); III, 0.323 to 0.374 mm. (av. 0.3536 mm.); IV, 0.2125 to 0.22 mm. (av. 0.2193 mm.); V, 0.187 to 0.204 mm. (av. 0.2024 mm.); VI, base 0.102 to 0.119 mm. (av. 0.1054 mm.); VI, spur 0.255 to 0.34 mm. (av. 0.2992 mm.); cornicles, 0.187 to 0.221 mm. (av. 0.204 mm.); cauda, 0.136 to 0.153 mm. (av. 0.142 mm.); hind tarsus, 0.119 mm.

Specimens taken by the author near Montebello, Los Angeles County, in December, 1916, and in Riverside from January to May, 1917, on *Vicia faba* seem to be somewhat different from the foregoing, yet are very nearly identical. Gillette considers that they might possibly be *Aphis fabae* Scop., which may or may not be synonymous with *Aphis euonomi* Fabr. Superficially, the coloring seems to be the same, although on close observation it appears to be a very dark green in ground color, covered with a blackish tinge. The legs are colored as above, however.

Specimens from *Rumex* appear to have considerably more brown in the ground color than the preceding varieties. Secondary sensoria are located as follows: III, 14 to 24 (av. 18); IV, 4 to 7 (av. 5); V,

I to 4 (av. 3). Lateral abdominal tubercles could be found only on the first and seventh segments.

Alate viviparous female.—Measurements: Body length, 1.768 to 2.142 mm. (av. 1.942 mm.); width of thorax, 0.782 to 1.054 mm. (av. 0.918 mm.); antennae total, 1.445 to 1.581 mm. (av. 1.496 mm.); III, 0.357 to 0.408 mm. (av. 0.394 mm.); IV, 0.255 to 0.323 mm. (av. 0.286 mm.); V, 0.204 to 0.255 mm. (av. 0.233 mm.); VI, base 0.136 to 0.153 mm. (av. 0.139 mm.); VI, spur 0.289 to 0.323 mm. (av. 0.306 mm.); cornicles, 0.187 to 0.255 mm. (av. 0.219 mm.); cauda, 0.136 to 0.17 mm. (av. 0.153 mm.); hind tarsus, 0.119 to 0.153 mm. (av. 0.147 mm.).

Apterous viviparous female.—Measurements: Body length, 2.278 to 2.448 mm. (av. 2.3403 mm.); antennae total, 1.309 to 1.598 mm. (av. 1.4382 mm.); III, 0.306 to 0.408 mm. (av. 0.3502 mm.); IV, 0.221 to 0.306 mm. (av. 0.2618 mm.); V, 0.206 to 0.255 mm. (av. 0.238 mm.); VI, base 0.119 to 0.17 mm. (av. 0.1394 mm.); VI, spur 0.289 to 0.34 mm. (av. 0.306 mm.); cauda, 0.17 to 0.204 mm. (av. 0.187 mm.); cornicle, 0.255 to 0.323 mm. (av. 0.289 mm.); hind tarsus, 0.153 to 0.17 mm. (av. 0.167 mm.).

122. *Aphis frigidae* Oestlund

Oestlund, Geol. Nat. Hist. Surv. Minn., vol. 14, p. 46, 1886 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 132, 1913 (desc. stem mother).

Records.—*Artemisia californica*; Walnut Creek, Contra Costa County (Davidson).

In company with *Macrosiphum artemisiae* (Fonse.) this species is found on sagebrush in the San Francisco Bay region. Wilson reports it from Oregon, so probably it is distributed along the coast from the bay north. In the course of observations in southern California during a period of two years the author has been unable to find any aphids infesting sagebrush.

123. *Aphis gossypii* Glover

Figures 192, 193, 215

Glover, Pat. Off. Rec., p. 62, 1854 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 250, 1903 (list).

Essig, Pom. Jour. Ent., vol. 1, p. 47, 1909. *Aphis citri* Ashmead (desc.).

Essig, Pom. Jour. Ent., vol. 3, p. 590, 1911 (desc.).

Cook, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 65, 1912 (list).

Carnes, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 398, 1912 (list).

Weldon, Mon. Bull. Cal. Comm. Hort., vol. 2, p. 597, 1913 (list).

Davidson, Mon. Bull. Cal. Comm. Hort., vol. 6, p. 65, 1917 (note).

Records.—*Cucumis* spp.; Newcastle, Placer County, Watsonville, Santa Cruz County (Clarke); Imperial County (Weldon); San Diego County, June, 1916: *Cucurbita* spp.; Alpine, San Diego County, June, 1916: *Citrus* spp.; Santa Paula, Claremont (Essig), Acampo, San Joaquin County (Carnes), San Diego, March, 1916 (R. R. McLean); Whittier, May, 1917: *Heracleum lanatum*; Berkeley, March, 1915 (Essig): *Begonia*; Stanford University, February, 1912 (Morrison), Riverside, January, 1917; *Punica granatum*, Stanford University, April, 1911 (Davidson): *Helianthus*; Santa Ysabel, San Diego County, May, 1916: *Persea gratissima*; Avondale, San Diego County, August, 1916; *Chrysanthemum*; Ontario, January, 1917; *Eschscholtzia californica*; Ontario, January, 1917: *Anthemis* spp.; Pasadena, April, 1917 (R. E. Campbell): *Pyrus* spp.; Santa Cruz County (Volek), Nevada County (Norton).

The melon or cotton aphid is distributed throughout the state and is found on a large number of host plants. On melons it is often a considerable pest, particularly in the Imperial Valley. In the apple sections of Santa Cruz and Nevada counties it often becomes abundant enough upon the young trees to cause considerable damage, according to County Horticultural Commissioners Volek and Norton. In San Diego County the author found an infestation on young avocado trees which was very severe. Oftentimes it becomes quite abundant in nurseries and greenhouses.

124. *Aphis hederæ* Kalt.

Kaltenbach, Monog. d. Pflanzenläuse, p. 89, 1843 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909. *A. rumicis* Linn. (list in part).

Essig, Pom. Jour. Ent., vol. 2, p. 335, 1910 (desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910. *A. rumicis* Linn. (list).

Records.—*Hedera helix*; Stanford University (Davidson), March, 1912 (Morrison); Claremont, Los Angeles County (Essig); San Jose, May, 1911 (Davidson, Morrison); Oakland, November, 1916 (Davidson); Berkeley, April, 1915; Lemon Grove, San Diego County, March, 1916; Riverside, October, 1916: *Chenopodium* sp., Walnut Creek, Contra Costa County, May, 1915 (Davidson).

Throughout the San Francisco Bay region and southern California a small dark brown to black aphid is often found in colonies on the tender shoots of English ivy. Essig described it as *Aphis hederæ* Kalt., but later it was believed to be *Aphis rumicis* Linn. (*A. euonomi* Fabr.). However, a careful study of a large series of specimens of this aphid from ivy and of *A. euonomi* Fabr. from a number of different host plants has convinced the author that they are distinct. Gillette is of the same opinion. Consequently the species from ivy in California is *Aphis hederæ* Kalt. In the author's collection there is a specimen from *Chenopodium* sp. taken by Davidson that appears to be the same species. The most noticeable difference between this

and *Aphis euonomi* Fabr. is in the length of the cornicles, which are very much longer in this species. Measurements of specimens of the alates from Oakland, Walnut Creek, San Jose, and Riverside are herewith given:

Measurements: Body length, 1.411 to 1.768 mm. (av. 1.621 mm.); width of thorax, 0.714 to 0.782 mm. (av. 0.748 mm.); antennae total, 1.411 to 1.549 mm. (av. 1.499 mm.); III, 0.323 to 0.391 mm. (av. 0.365 mm.); IV, 0.272 to 0.323 mm. (av. 0.2914 mm.); V, 0.221 to 0.272 mm. (av. 0.2518 mm.); VI, base 0.119 to 0.136 mm. (av. 0.311 mm.); VI, spur 0.306 to 0.34 mm. (av. 0.323 mm.); cauda, 0.136 mm.; cornicle, 0.306 to 0.34 mm. (av. 0.3252 mm.); third tarsus, 0.119 to 0.136 mm. (av. 0.1237 mm.).

It will be seen that the cornicles are considerably more than twice as long as the hind tarsi, in some cases practically three times, while in *A. euonomi* Fabr., they are scarcely twice as long as the hind tarsi. In *A. euonomi* Fabr. the hind tarsi are longer than the base of VI, while the cornicles are shorter than VI spur. In *A. hederæ* Kalt. VI spur and the cornicles are subequal or on the average the cornicles are very slightly longer, while VI base and the hind tarsi are also subequal, the tarsi being shorter on the average. The secondary sensoria in *A. hederæ* Kalt. are small, irregular in size, and are scattered more or less irregularly along III but in a fairly even row along IV and V. They appear very much the same as in *A. euonomi* Fabr. There are from thirteen to twenty on III, seventeen being the average; from five to nine on IV, seven and eight being the usual number; and usually one on V, although in a few cases there appear to be none.

125. *Aphis heraclei* Cowen

Cowen, Hemip. Colo., p. 120, 1895 (orig. desc.).

Essig, Univ. Calif. Publ. Entom., vol. 1, p. 339, 1917 (list).

Record.—*Heracleum montezumum*; Berkeley (Essig).

Recently Essig reported having taken this species on *Heracleum* in Berkeley. The author has specimens from Essig, although he has never collected it himself. This is the only report of the species since Cowen's original report and description.

126. *Aphis houghtonensis* Troop?

Troop, Ent. News, vol. 17, p. 59, 1906 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 132, 1914 (list).

Record.—*Ribes sanguineum*; Contra Costa County (Davidson).

Davidson reported a species of *Aphis* infesting the terminal leaves of wild currant in the canyons of Contra Costa County. He identified it provisionally as this species as he was uncertain. The author is unacquainted with it.

127. *Aphis lithospermi* Wilson

Wilson, Trans. Am. Ent. Soc., vol. 41, p. 100, 1915 (orig. desc.).

Record.—*Lithospermum pilosum*; California (Wilson).

There is no definite record of this species in California, but it is listed here because Wilson added it to a list of the California Aphididae submitted to him by the author.

128. *Aphis maidis* Fitch

Figures 216 to 218

Fitch, Insects N. Y., vol. 1, p. 318, 1855 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 251, 1903 (list).

Davidson, Jour. Econ. Ent., vol. 5, p. 408, 1912 (list).

Records.—Corn; Watsonville, Berkeley (Clarke); San Jose (Davidson); Lakeside, San Diego County, April, 1916; Chula Vista, San Diego County, August, 1916; sorghum; Julian, San Diego County, August, 1916 (H. M. Armitage); Corona, Riverside County, September, 1916.

Only occasionally is this corn aphid found in California, where it infests the ears and tassels and leaves of corn and some of the sorghums. Never has it been observed as injurious as is sometimes reported from the middle western states.

129. *Aphis malifoliae* Fitch

Figures 248 to 250

Fitch, Trans. N. Y. State Agr. Soc., vol. 5, p. 14, 1854 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903. *Aphis sorbi* Kalt. (list).

Carnes, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 400, 1912. *A. sorbi* Kalt. (list).

Weldon, Mon. Bull. Cal. Comm. Hort., vol. 3, p. 188, 1914. *A. sorbi* Kalt. (list).

Baker and Turner, Jour. Agr. Res., vol. 7, pp. 321–343, 1916 (complete account).

Records.—*Pyrus malus*, *P. communis*; Central and northern California; Orange County, May, 1917.

This is one of the most injurious of our California species of *Aphis*, being found in practically all of the apple-growing regions of the state, and in most of them necessitating some control measures. It has been reported on apple and pear in the following counties: Humboldt, Orange, Placer, Sacramento, Santa Clara, Shasta, Tehama, Nevada, Inyo, Santa Cruz, and Alameda. Probably it is present wherever apples are grown, with the exception of the southern California districts where it has never been observed. The apple is the primary host, and only occasionally has it been taken on pear. In May, 1917, Roy K. Bishop found it in Orange County, this being the first report of it south of the Tehachapi.

The life history of this *Aphis* in California is as follows:

In the fall and early winter the eggs are laid in the crotches of the twigs. These hatch in the following spring, the exact time depending upon the weather conditions but it is usually as the buds are beginning to show green, or as they are beginning to open. The author has observed the young stem mothers on the young buds of the apple in the latter part of March, although he has never been able to find the eggs, either those yet unhatched or those from which the stem mothers have already hatched. Horticultural Commissioner Weatherby of Humboldt County writes that he has found the eggs hatching as early as February 24. He goes on to state that the eggs of *Aphis pomi* De Geer do not hatch until considerably later. Horticultural Commissioner Norton of Nevada County has made the following observations:

The eggs of *Aphis sorbi* [malifoliae] are laid on the buds, or sometimes on the spurs close to the buds. At first they are hard to see as they are small and light green, but later they turn to a shiny black, when they can be more readily detected. The young aphids hatch as soon as the buds begin to swell, which time varies with the season. I have found them sometimes as early as the first of March and at other times as late as the middle of April.

The stem mothers feed upon the plant juices through the buds, sometimes appearing on the outer surface of the buds and at other times crawling down into the unfolding leaves, as is the case with *Aphis pomi* De Geer. In a few weeks these are mature and begin to deposit live young. All of this second generation are apterous females so far as the author has been able to observe. On April 12, 1915, he found several colonies of these aphids in the apple orchard at Stanford University, each colony consisting of a stem mother and several young apterous viviparous females. These females mature in a few weeks

and a third generation is begun. The most usual place to find the second and third generations is in the curled terminal leaves of the plant. These leaves are curled very similarly to those by the green apple aphid (*Aphis pomi* De Geer), but they are curled a great deal tighter. Winged females may appear in this third generation, but it is most usual to find them in the fourth. Horticultural Commissioner Volek of Santa Cruz County states that he has counted four generations before the summer migration. During May, 1915, the author collected many colonies of this *Aphis* and placed them in vials in the laboratory. Many others he attempted to colonize on some apple seedlings. Owing to various causes he was unable to make any successful colonizations on the apple trees, one of the chief causes being the destructive work of coccinellid larvae. Also during the first few days of June he was forced to be absent from town and on his return found that the gardener had "cleaned" the trees, for "they were all covered with lice." Until May 25 no alate females had been found, but on that date two appeared in the laboratory. On May 10, 1917, alates were found in Orange County.

These alate females of the fourth (perhaps sometimes they appear in the third) generation migrate from the apple to some unknown host. At Stanford University in 1915 the migration began about the first of June and continued for some two or three weeks. On June 20 only two or three colonies, each consisting of but a very few individuals, were found where a month before there had been literally hundreds. The curled leaves still hung on the trees and in each curled leaf the moulted skins of the aphid were abundant. From Commissioner Norton of Nevada County comes the statement that he has known the migrants "to leave the trees as early as the middle of June, but the migration usually takes place between the first and the fifteenth of July. Where they go I have never been able to find out, as I have never observed them on any other host plant."

According to O. E. Bremner, Horticultural Commissioner of Sonoma County, the migration takes place there during June. This is the same as in Santa Clara County. In Orange County in 1917 the alate females appeared about the first of May. Migration began almost immediately and continued for two or three weeks. By May 24 only a very few aphids remained. This is fully a month earlier than migration takes place north of the Tehachapi. Incidentally the spring of 1917 was exceedingly cool and the summer very late. In normal years one would expect the aphids to leave the apple two or three weeks earlier.

The summer host plant of this aphid is as yet unknown in California. During June, 1915, the author spent many hours in search of this host plant, but to no avail. He examined every kind of plant within two or three hundred yards of the apple orchard at Stanford University, but on none was he able to find any aphid that could possibly be the summer form of *Aphis malifoliae* Fitch. Bremner reports having found isolated individuals on pigweed (*Amaranthus retroflexus*) in Sonoma County, but believes this to be accidental for he has never observed them to deposit young on this plant. Davidson writes that he has been able to colonize them in the laboratory on the leaves of plantain (*Plantago* spp.), in fact has been able to have them reproduce in such large numbers as to kill the plants. On May 28, 1915, the author placed two alate females from apple leaves on each of two specimens of *Plantago hirtella* under bell jars in the laboratory at Stanford University. On returning to town on June 10 he found that the plants were in a dying condition, owing to a lack of proper care during his absence. However, he found many young lice present, all of which were alive and feeding. The adult alate females had already died. By June 16 the lice had moulted once, but then the plants were practically dead. He left Stanford within a few days not to return, so was unable to begin fresh experiments along this line. In his search for the alates in the field he was particularly careful to examine closely every plantain plant in the vicinity, but could find no trace of this aphid on them. Davidson also reports the same lack of success. Consequently, although the alates will deposit young on plantain in the laboratory it cannot very well be the natural summer host in this state. Baker and Turner have proven that *Plantago lanceolata* is the summer host in Virginia. W. H. Britain has observed a definite migration to plantain in Nova Scotia (Proc. Ent. Soc. Nova Scotia, vol. 1, pp. 16-30, 1915). Incidentally he has been able to breed it throughout the summer on apple. In Orange County, in the vicinity of the known infestations, the author was unable to find any plantain whatsoever. On inquiring of Roy K. Bishop, the county horticultural commissioner, it was learned that plantain is very scarce in that county, except very near to the coast, and that it is exceedingly doubtful if there is any in the vicinity of the known aphid infestations.

The fall migrants begin to return to the apple some time during the fall and deposit living males and females. From Nevada County comes the report that the migrants return to the apple "between the twentieth of September and the first of October." Davidson has taken the oviparous females and the alate males on December 5 (1912) at

Sebastopol; Morrison has taken the sexes at Stanford University on December 16 (1910); Moznette of the Oregon station has taken the migrants as late as the middle of November at Corvallis, Oregon. Consequently, egg laying probably occurs from the middle of October well into December in the various parts of California. Commissioner Norton states: "The first eggs that I have seen were observed about the fifteenth of October. However, they continue egg laying, in favorable years, well along into November."

The injury caused by this aphid is done entirely in the spring of the year, before the summer migration, and consists in the curling of the terminal leaves. The colonies are found usually in the leaves surrounding a cluster of apples, and although most of the feeding is on the leaves themselves oftentimes they feed upon the fruit. In such a case the fruit (according to Weldon, "Apple Growing in California," Mon. Bull. Cal. Comm. Hort., p. 86, 1915) "is injured to such an extent that it becomes stunted and not only fails to mature, but is distorted so badly that the variety may not be recognizable." In Nevada County, Commissioner Norton reports: "The purple aphid unless controlled lessens the apple crop from ten to fifteen per cent." This is a higher percentage, undoubtedly, than is common throughout the state, but it shows how serious the pest may be.

130. *Aphis marutae* Oestlund

Figures 293 to 299

Oestlund, Minn. Geol. Nat. Hist. Surv., vol. 14, p. 40, 1886 (orig. desc.).

Records.—*Silybum marianum*; Grossmont, San Diego County, April, 1916: *Centaurea melitensis*; El Cajon, San Diego County, May, 1916.

In April, 1916, the author observed a small aphid on milk thistle near Grossmont, San Diego County, and later on *tacalote* in the El Cajon Valley. It infested the smaller leaves, the leaf petioles, and the base of the flowers. Large numbers of ants were in attendance, but it was preyed upon extensively by the larvae and adults of *Coccinella californica*. A considerable number of adults of *Lysiphlebus testaceipes* Cresson were reared from colonies of this aphid. Being unknown to the author specimens were sent to J. J. Davis and E. O. Essig, both of whom determined the species to be *Aphis marutae* Oestlund. Inasmuch as Oestlund's descriptions are the only ones available, a brief description is given below of specimens taken May 1, 1916, on *Silybum marianum* in San Diego County.

Alate viviparous female.—Prevailing color pale to olive green. Head and prothorax dark olive green, thoracic lobes almost black. Abdomen pale green with marginal spots and patch on dorsum dusky. Legs pale except tarsi, apex of tibiae, and apical two-thirds of femora. Antennae, cornicles, and cauda dusky. Beak pale at base and dusky at tip.

Head (fig. 293) not quite as long as broad, with a prominent tubercle at apex of front and small but distinct projections from head on inner side of first antennal segments. Antennae about same length as body or slightly longer or slightly shorter (figs. 294–295). III and the spur are about equal or III slightly longer, never shorter than spur. IV about one-half as long as III. V either shorter or equal to IV. VI shorter than V and about one-third as long as spur. I and II subequal and slightly shorter than VI. The usual primary sensoria are present on V and VI and the accessory sensoria on VI. III is tuberculate and IV is slightly so. IV has from two to six small, circular secondary sensoria and III from eleven to fifteen irregularly placed (fig. 294). The beak reaches considerably beyond the second coxae, in some cases almost to the third.

The prothorax is without lateral tubercles. The wings are about twice as long as the body with normal venation. The stigmal vein is curved its entire length, the second branch of the cubitus arises about midway between the tip of the wing and the base of the first branch.

The abdomen is without lateral tubercles in so far as the author can discern. The cornicles (fig. 299) are short and taper slightly from base to apex. They are about equal in length to the third tarsi, are almost one-half as wide at base as long, and about one-third as wide at apex as long. The cauda (fig. 298) is short and blunt (conical) and about two-thirds as long as the cornicles. The anal plate is half-moon-shaped and dusky at its distal edge.

Measurements (of specimens in Canada balsam): Body length, 0.918 to 1.02 mm. (av. 0.9248 mm.); width (thorax), 0.34 to 0.442 mm. (av. 0.4082 mm.); antennae total, 0.885 to 1.02 mm. (av. 0.942 mm.); I, 0.034 to 0.051 mm. (av. 0.037 mm.); II, 0.034 to 0.051 mm. (av. 0.048 mm.); III, 0.225 to 0.2975 mm. (av. 0.2601 mm.); IV, 0.117 to 0.17 mm. (av. 0.152 mm.); V, 0.1105 to 0.136 mm. (av. 0.1346 mm.); VI, 0.068 to 0.102 mm. (av. 0.0833 mm.); spur, 0.204 to 0.272 mm. (av. 0.2295 mm.); cornicles 0.0850 to 0.119 mm. (av. 0.0978 mm.); cauda, 0.0595 to 0.068 mm. (av. 0.0624 mm.); hind tarsi, 0.085 to 0.102 mm. (av. 0.0901 mm.); wing length, 1.921 to 1.955 mm. (av. 1.928 mm.); wing width, 0.661 mm.; wing expansion, 4.556 mm.

Apterous viviparous female.—The apterae are quite similar to the alates except that the thorax is not dark, and that the second, third, and basal three-fourths of the fourth antennal segments are pale. There are no secondary sensoria (fig. 296) and no lateral tubercles on prothorax and abdomen (fig. 297). The individuals are slightly larger and the proportions of the antennal segments differ slightly from the alates. The measurements of specimens mounted in Canada balsam are as follows:

Measurements: Body length, 1.00 to 1.04 mm. (av. 1.026 mm.); width (abdomen), 0.595 to 0.629 mm. (av. 0.6064 mm.); antennae total, 0.561 to 0.697 mm. (av. 0.6151 mm.); III, 0.102 to 0.136 mm. (av. 0.1218 mm.); IV, 0.0765 to 0.1105 mm. (av. 0.0906 mm.); V, 0.068 to 0.085 mm. (av. 0.0765 mm.); VI, 0.595 to 0.0765 mm. (av. 0.068 mm.); spur, 0.1615 to 0.1785 mm. (av. 0.1711 mm.); cornicles, 0.0765 to 0.11 mm. (av. 0.0935 mm.); cauda, 0.0595 mm.; hind tarsi, 0.102 mm. (Description from nine specimens of apterae). It will be noticed that in the apterae the antennae are but about two-thirds as long as the body, while in the alates they are almost as long as the body. Furthermore, in the apterae the spur of the sixth antennal segment is always longer than III while in the alates it is equal to III at the most, and in many cases shorter.

131. *Aphis medicaginis* Koch

Figure 189

Koch, Die Pflanzenläuse, p. 94, 1854 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 376, 1910 (list).

Essig, Pom. Jour. Ent., vol. 3, p. 527, 1911 (desc.).

Records.—*Medicago hispida*; Stanford University (Davidson), April, 1914 (R. W. Haegeler): *Astragalus leucopsis*; Nordhoff, Ventura County (Essig): *Vicia faba*, lima bean, Pasadena (R. E. Campbell).

This small dark *Aphis* has been found occasionally in California, particularly on alfalfa and beans. Such other plants as loco weed, licorice, sagebrush, locust, and others are said to be hosts. The author has never collected it himself, but has had access to specimens taken by Essig, Haegeler, and Campbell. Davidson has reared the braconid fly, *Lysipheebus testaceipes* Cresson, from this aphid.

132. *Aphis middletonii* Thomas

Figures 219, 220

Thomas, 8th Ann. Rep. Ill. St. Ent., p. 99, 1879 (orig. desc.).

Records.—*Amaranthus retroflexus*; Santa Paula, August, 1911 (Essig); *Ranunculus californicus*; Julian, San Diego County, June, 1916; *Hemizonia rudis*; Stanford University, 1916 (Ferris); *Helianthus annuus*; Riverside, September, 1916.

In the fall of the year this species is rather common on the roots of various plants in California. The individuals are small green aphids, covered with a slight pulverulence. They are very similar to *Aphis maidis-radidis* Forbes, with which they have often been confused, and differ particularly in the presence of secondary sensoria on the fourth antennal segment of the apterae. Below are a few descriptive notes taken from specimens mounted in balsam, collected in 1916 in Julian and Riverside, and in 1911 near Santa Paula:

Alate viviparous female.—Greenish, pruinose. Head, antennae, thorax, marginal spots on abdomen, cornicles, cauda, apical one-half femora, apices tibiae, tarsi, and apex of beak, black. Antennae reach to the base of the second abdominal segment; III being the longest segment, followed by VI spur. IV and V are subequal, VI base slightly shorter. The usual primary and accessory sensoria are present. Secondary sensoria occur on III and IV (fig. 220). There are nine to twelve on III, and one to four on IV. The average numbers are eight and two respectively. The beak reaches to the third coxae. Prominent lateral tubercles are present on the first and seventh abdominal segments, as well as on the prothorax. The cornicles are short and taper slightly toward the apex. They are subequal in length to the hind tarsi, and very slightly larger than the cauda. The wings are normal, with the second branch of the third discoidal arising nearer to the apex of the wing than to the base of the first branch.

Measurements: Body length, 1.65 to 1.7 mm. (av. 1.674 mm.); width of thorax, 0.561 mm.; antennae total, 0.816 to 0.918 mm. (av. 0.884 mm.); III, 0.204 to 0.255 mm. (av. 0.2338 mm.); IV, 0.11 to 0.119 mm. (av. 0.1169 mm.); V, 0.11 to 0.136 mm. (av. 0.1275 mm.); VI, base 0.085 to 0.102 mm. (av. 0.0986 mm.); VI, spur 0.204 mm.; cauda, 0.102 mm.; cornicles, 0.1275 to 0.136 mm. (av. 0.1332 mm.); hind tarsus, 0.119 to 0.136 mm. (av. 0.1303 mm.); wing length, 1.904 to 2.38 mm. (av. 2.159 mm.); width, 0.731 to 0.85 mm. (av. 0.815 mm.); expansion, 4.3 to 5.1 mm. (av. 4.717 mm.).

Apterous viviparous female.—These are very similar to the alate females, only slightly larger. The antennae are dusky throughout except the base of III. They reach to the base of the first abdominal segment. III is the longest segment. VI spur is next, being about two-thirds as long. IV, V, and VI base are subequal, with V somewhat shorter than the others. The usual primary and accessory sensoria are present on V and VI. III has two or three small secondary sensoria located in the apical one-third of the segment. IV has from one to three in the apical one-half. The prothorax and the first and seventh abdominal segments each have a pair of conspicuous lateral tubercles. The cornicles are black and somewhat larger than in the alates, being slightly longer than the hind tarsi. The cauda is a little shorter than the hind tarsi.

Measurements: Body length, 1.632 to 1.785 mm. (av. 1.708 mm.); width of thorax, 0.748 to 0.85 mm. (av. 0.799 mm.); antennae total, 0.867 to 0.969 mm. (av. 0.9265 mm.); III, 0.2465 to 0.289 mm. (av. 0.2635 mm.); IV, 0.102 to 0.136 mm. (av. 0.119 mm.); V, 0.102 to 0.119 mm. (av. 0.1105 mm.); VI, base 0.119 mm.; VI, spur 0.1615 to 0.187 mm. (av. 0.17 mm.); cornicles, 0.153 to 0.17 mm. (av. 0.1615 mm.); cauda 0.119 mm.; hind tarsus, 0.136 mm.

133. *Aphis mori* Clarke

Clarke, Can. Ent., vol. 35, p. 251, 1903 (orig. desc.).

Record.—*Morus* sp., Berkeley (Clarke).

This is a rather doubtful species, described by Clarke from specimens taken on mulberry in Berkeley. Since the original description it has never again been observed.

134. *Aphis neomexicana* Ckll. var. *pacifica* Dvdn.

Figures 300, 302

Davidson, Jour. Econ. Ent., vol. 10, p. 293, 1917 (orig. desc. var.).

Records.—*Ribes rubrum*; Walnut Creek, Contra Costa County, and San Jose (Davidson).

Davidson described this variety from specimens found curling the leaves of cultivated red currant in Walnut Creek in June, 1915. What he takes to be the same species he had already collected in San Jose in May, 1912. The author has specimens from him, but has never collected any himself.

135. *Aphis nerii* Fonse.

Figures 221, 222

Boyer de Fonscolombe, Ann. Ent. Soc. France, vol. 10, p. 167, 1841 (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *A. lutescens* Monell (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 399, 1911. *A. lutescens* Monell (list).

Essig, Pom. Jour. Ent., vol. 3, p. 401, 1911. *A. lutescens* Monell (desc.).

Essig, Pom. Jour. Ent., vol. 3, p. 530, 1911 (desc.).

Branigan, Mon. Bull. Cal. Comm. Hort., vol. 4, p. 53, 1915 (list).

Records.—*Asclepias mexicana*; Stanford University (Davidson); Stanford University, October, 1910 (Morrison); Penryn, Placer County (Davidson); southern California (Essig); Berkeley, July to September, 1915: *Nerium oleander*; southern California (Essig); Sacramento (Branigan); Berkeley, August to December, 1915; San Diego, 1916.

In the late spring, summer, and early fall milkweeds throughout the state are often seen to be infested with a bright yellow and black aphid. In the fall and early winter this same species is found infesting oleanders. Where oleanders are present but no milkweeds this aphid can be found from spring until winter on the oleander, as observed during 1916 in San Diego.

Heretofore the species on oleander and milkweed have been considered as distinct, the former being called *A. lutescens* Monell, the latter *A. nerii* Fonse. According to a note from J. J. Davis the species on milkweed could not be *A. lutescens* Monell. Following are extracts from his letters concerning this point:

I am wondering whether you have ever found winged specimens on *Asclepias* that do not bear the black markings at the base of the cornicles. All the specimens that I have collected and which Mr. Monell has collected in recent years have these black markings at the base of the cornicles in the winged forms. However, in referring to an old note from Mr. Monell, he says that it would seem hardly possible that he could have missed these dark spots if they had been present in the specimens from which he drew his description for *Aphis lutescens*, and remarks further that he is not sure that he has ever seen *A. lutescens* alive since he first described it. I am wondering if *lutescens* is not really *asclepiadis* of Passerini and whether our other common species on *Asclepias* and *Nerium* is not *nerii* Fonse.

During the summer of 1915 the author found this species on *Asclepias* in the Botanical Gardens at the University of California. During July and August it was quite abundant; in fact, it was especially thick on the stems and undersides of the leaves and blossoms. However, in the latter part of August it seemed to be getting less

and less numerous. No sign of parasites was present, and the predaceous enemies were not more abundant than usual, so a search for the cause was made. Within fifty feet of the milkweed plants several oleanders were found and on them was noticed a large yellow species of *Aphis*. This supposedly was *Aphis nerii* Fonsc. In the laboratory the author could find no structural difference whatsoever between this species and the one on *Asclepias*, so he continued to watch them carefully on the hosts. As the days passed the *Asclepias* became freer and freer of the infestation, while the *Nerium* became more and more heavily infested. This continued through September and into October, by which time the *Asclepias* had died down and incidentally no aphids were left. The *Nerium* was very heavily infested then. This was taken as a good proof that these were the same species. Later Essig told the author that the summer before (1914) he had made transfer tests in the laboratory of specimens from *Asclepias* to *Nerium* and that they thrived there and bred well. This fact and the observations above mentioned were noted in a letter to Davis. Following is his answer:

I have your letter relative to *Aphis asclepiadis* and *nerii*, and am interested in your observations. In 1914, Theobald described a species under the name of *Aphis nigrepes*, which he now places as a variety of *asclepiadis*. He considers *nerii* as distinct from *asclepiadis* because the latter lacks the black patches at the base of the cornicles. Passerini's *asclepiadis* is entirely different from Fitch's *Aphis asclepiadis*. Fitch's name has priority for, as you will notice, it was described in 1851. This being the case, Passerini's name will have to fall and be replaced by *Aphis lutescens* of Monell, which according to Mr. Monell's data does not bear the black patches around the base of the cornicles.

This would seem to indicate that the California species on *Asclepias* is *Aphis nerii* Fonsc. and not *A. lutescens* Monell, as brought out by Essig's experiment and by the author's observation. Consequently this Californian species is *Aphis nerii* Fonsc., with *Asclepias* for its summer host and *Nerium* for the winter host.

136. *Aphis oenotherae* Oestlund

Oestlund, Minn. Geol. Nat. Hist. Surv., Bull. 4, p. 62, 1887 (orig. desc.).
Clarke, Can. Ent., vol. 35, p. 252, 1903 (list).

Record.—*Oenothera bectiana*; *Epilobium* sp., Berkeley (Clarke).

In 1903 Clarke recorded finding this species on primrose and willow herb in Berkeley. Since then it has not been observed in California. The author has had the opportunity to study specimens from Minnesota, taken by A. C. Maxson.

137. *Aphis oregonensis* Wilson

Wilson, Trans. Am. Ent. Soc., vol. 41, p. 92, 1915 (orig. desc.).

Record.—*Artemisia tridentata*, California (Wilson).

Wilson stated to the author that he had taken this species in California although he gave no locality or date records. On the strength of his statement it is included among the California aphids. The author has never seen specimens of it.

138. *Aphis persicae-niger* Smith

Figures 223, 224

Smith, Ent. Am., p. 101, 1890 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903 (list).

Gillette, Jour. Econ. Ent., vol. 1, p. 308, 1908 (desc.).

Weeks, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 244, 1912 (list).

Jones, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 318, 1912 (list).

Carnes, Mon. Bull. Cal. Comm. Hort., vol. 1, p. 399, 1912 (list).

Wood, Mon. Bull. Cal. Comm. Hort., vol. 2, p. 570, 1913 (list).

Records.—*Prunus* spp.; throughout California.

This species is ordinarily found infesting the tender twigs and leaves of peach in the spring and early summer. Occasionally it is found on nectarine, plum, and cherry. There are two records of its occurrence on cherry known to the author; one in San Jose in May, 1912, by Davidson, and one in El Cajon, San Diego County, in May, 1916, by the author. Definite reports of its presence on peach come from Los Angeles, Placer, Riverside, San Benito, San Bernardino, San Diego, Santa Clara, and Tehama counties. In May, 1916, the author observed it doing considerable damage to a young peach orchard in the El Cajon Valley, San Diego County. Many of the twigs and some of the larger branches were killed back for several inches, due to the ravages of this insect.

The *Hippodamia* ladybird and the larvae of a syrphid fly were abundant and devouring vast numbers of the aphids. However, it is not often that this appears abundant enough to cause any great amount of damage.

Its life history, although not thoroughly worked out, is interesting. The following brief summary is from Essig:¹⁷

The insect winters over on the roots of the peach trees, where it may also be found in the summer. The first aphids appear above ground very early in the

¹⁷ Essig, E. O., Beneficial and injurious insects of California; ed. 2. Suppl. Mon. Bull. Cal. Comm. Hort., vol. 4, pp. 91-92, 1915.

spring and begin attacking the tender leaflets, shoots and suckers, usually those at the base of the tree or nearest the ground. These first plant lice are all wingless. As soon as the buds, young fruit, and leaves appear they are promptly attacked, the entire crop often being entirely ruined. The leaves are curled and weakened, while the young fruit is so distorted as to be killed or rendered unfit for market. During the months of April and May winged migratory females appear, which start colonies on other trees. The work continues until about the middle of July, when most of the lice leave the tops and again go to the roots.

139. *Aphis pomi* De Geer

Figures 225 to 227

- De Geer, *Memoires*, vol. 3, p. 173, 1773 (orig. desc.).
 Davidson, *Jour. Econ. Ent.*, vol. 2, p. 301, 1909 (list).
 Davidson, *Jour. Econ. Ent.*, vol. 3, p. 377, 1911 (list). *Aphis mali* Fabr.
 Weatherby, *Mon. Bull. Cal. Comm. Hort.*, vol. 1, p. 318, 1912 (list).
 Carnes, *Mon. Bull. Cal. Comm. Hort.*, vol. 1, p. 399, 1912 (list).
 Branigan, *Mon. Bull. Cal. Comm. Hort.*, vol. 4, p. 285, 1915 (list).
 Hurdley, *Mon. Bull. Cal. Comm. Hort.*, vol. 4, p. 445, 1915 (list).
 Baker and Turner, *Jour. Agr. Res.*, vol. 5, pp. 955-995, 1916 (complete account).

Records.—*Pyrus malus*; *Crataegus oxyacantha*; *Catalpa* sp.; California.

In California this species has been reported on apple and hawthorn (*Crataegus* sp.) at Stanford University by Davidson and Morrison; in Humboldt County by Weatherby; at Santa Rosa by Carnes; and by others in Orange, Placer, Sonoma, Santa Cruz, San Bernardino, and Monterey counties. Horticultural Commissioner Armitage states that it has never been found in San Diego County, and Horticultural Commissioner Norton writes that it is unknown in Nevada County. These are the only two of the apple growing regions of the state in which it is not known. The author has found it at Stanford University on apple, catalpa, pear, and hawthorn, and at Marysville on catalpa. Gillette lists loquat, quince, and flowering crab as additional hosts. It seems to prefer the apple to other hosts, and it is on the apple that its greatest injury is done. Gillette states: "Among the apple trees it has its preference. Missouri Pippin seems to be its first choice, while Rome Beauty, Black Twig, Ben Davis, and a few others are second choice, and the Northern Spy is scarcely attacked." The fact that the Northern Spy is almost immune is interesting in that this variety is also quite immune to the devastations of the woolly aphis (*Eriosoma lanigera* Hausman).

The life history of this aphid is quite similar to that of many other species, and is as follows:

The eggs are laid in the fall of the year, probably during the latter part of October, throughout November, and on into December. They are laid for the most part on the smooth bark of the suckers and water sprouts of the newer shoots. The author has found them in the crotches of the twigs and stems where the bark is rougher, but this is not the usual place. These eggs hatch in the spring about the time the buds begin to show green. In California this is usually during March, although some seasons it is as early as the middle of February, depending entirely upon the weather conditions. These stem-mothers at first feed on the young buds, until the latter have opened enough to allow the aphids to crawl down into the curled leaves. Here they feed for two or three weeks, when they mature and begin depositing living young. This second generation consists chiefly of apterous females, which mature in from two to four weeks and in turn produce young. The following generations are in large part alate females which migrate to other trees and there form new colonies. The alates are most common at Stanford University during the latter part of May and during the month of June. After June they seem to lessen in number, perhaps due to the predaceous and parasitic enemies. The first alates that the author has found in the spring were taken at Stanford University on April 13, 1914. In the fall, often as early as October, sexual males and females begin to appear, the males being apterous, the females alate. These mate and very soon the female lays its eggs. Egg laying begins usually in the latter part of October, just as the leaves are beginning to fall, and continues into December after the trees are bare. These eggs hatch in the spring into stem mothers, and the life cycle is completed.

140. *Aphis prunorum* Dobr.

Figures 228 to 230

Dobrowljansky, Zur Biol. d. Blattläuse d. Abtbaume u. Bürenstaucher, 1913 (orig. desc.).

Patch, Maine Agr. Exp. Sta., Bull. 233, p. 262, 1914 (desc. note).

Records.—*Prunus domestica*; Walnut Creek (Davidson); San Francisco, April, 1915 (Shinji).

A species of *Aphis*, supposed to be this species, has been taken on prune and plum in the San Francisco Bay region. It agrees very well with Dr. Patch's description listed. However, it may prove to be synonymous with *Siphocoryne nymphaeae* (Linn.).

141. *Aphis pseudobrassicae* Davis

Figure 231

Davis, Can. Ent., vol. 46, p. 231, 1914 (orig. desc.).

Records.—*Brassica* spp.; Walnut Creek (Davidson), San Diego, Riverside: *Raphanus* sp., Riverside, September, 1916, June, 1917: *Matthiola annua*, Riverside, February to May, 1917.

Oftentimes in the spring this false cabbage aphid is found in large colonies on radish, mustard, and so forth. Davidson has taken it in the San Francisco Bay region, and the author throughout southern California. The first few times that it was observed by the author colonies of *Aphis brassicae* Linn. were also abundant. This led the author to doubt its validity, and to undertake some breeding experiments. In February, 1917, two colonies were started, each from one alate female. They were followed through three generations, with the result that all the individuals proved to be this species. At the same time a colony of *Aphis brassicae* Linn. was started from one alate. All the progeny of this individual proved to be the same. *A. pseudobrassicae* Davis differs from *A. brassicae* Linn. in the following major points:

<i>A. pseudobrassicae</i> Davis:	<i>A. brassicae</i> Linn.:
Apterae not pulverulent.	Apterae pulverulent.
Cornicles of apterae longer than hind tarsi.	Cornicles of apterae shorter than hind tarsi.
IV of alates with sensoria.	IV of alates without sensoria.

142. *Aphis ramona* Swain

Figures 232 to 235

Swain, Trans. Am. Ent. Soc., vol. 44, p. 14, 1918 (orig. desc.).

Records.—*Ramona stachyoides*; Nordhoff and Santa Paula, Ventura County (Swain).

This species has been taken twice in Ventura County by Essig. It was described by the author from the specimens taken by Essig on black sage.

143. *Aphis rubiphila* Patch

Patch, Maine Agr. Exp. Sta., Bull. 233, p. 269, 1914 (orig. desc.).

Records.—*Rubus* spp.; San Jose, May, 1916 (Davidson).

In the summer of 1916 Davidson found a species of *Aphis* infesting loganberries and blackberries in San Jose, which was determined by Dr. Patch as *A. rubiphila* Patch. Essig believes this to be a synonym

of *A. gossypii* Glover, but as the author has not had an opportunity to study specimens he believes it best to recognize it as a distinct species at present.

144. *Aphis salicicola* Thomas

Figures 188, 238, 237

Thomas, Ill. Lab. Nat. Hist., Bull. 2, p. 8, 1879 (orig. desc.).

Williams, Univ. Neb. Studies, vol. 10, p. 139, 1910 (desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 408, 1912 (list).

Records.—*Salix laevigata*; Berkeley, June, 1915: *Salix*, sp.; San Jose (Davidson).

This is an uncommon species, found in the San Francisco Bay region on willow. The individuals are found in large colonies on the terminal shoots and leaves. These colonies consist in large part of apterae, there being but a very few alates. The species is quite easily recognized by the long cornicles and by the very short second branch of the third discoidal vein.

145. *Aphis sambucifoliae* Fitch

Figure 240

Fitch, Cat. Homop. N. Y., p. 66, 185 (orig. desc.).

Sanborn, Kan. Univ. Sci. Bull. 3, p. 52, 1904 (desc.).

Records.—*Sambucus glauca*; Oakland, April, 1915 (Essig); Berkeley, July, 1915.

In 1915 this species was taken twice, once by Essig in Oakland and once by the author in Berkeley. This medium-sized black aphid occurs in large colonies on the tender shoots and flower heads of the common elderberry. In southern California the author has examined hundreds of elderberry trees for this form, but has never found it. Only once has he found any aphid on elderberry in the south, and these proved to be *Rhopalosiphum persicae* (Sulz.).

146. *Aphis senecio* Swain

Figures 2, 4, 6, 241 to 245

Davidson, Jour. Econ. Ent., vol. 2, p. 302, 1909. *Aphis* sp. (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *A. bakeri* Cowen (list).

Davidson, Jour. Econ. Ent., vol. 7, p. 133, 1914. *A. bakeri* Cowen (list).

Swain, Trans. Am. Ent. Soc., vol. 44, p. 16, 1918.

Records.—*Abutilon* sp.; Stanford University, February, 1915: *Ambrosia psilostachya*; Berkeley, 1915 (Essig): *Amsinckia* spp.; Stanford University, 1909 (Davidson), 1912 (Morrison); Berkeley, 1915 (Essig): *Anthemis* spp.; San

Francisco Bay region, 1914 (Davidson); Pasadena, May, 1917 (Roy E. Campbell): *Artemisia* spp.; San Francisco Bay region, 1914 (Davidson); Berkeley, 1915 (Essig): *Aster* sp.; San Diego, January, 1916; Ontario, January, 1917: *Baccharis pilularis*; Berkeley, 1915 (Essig), Stanford University, 1916 (Ferris): *Calendula officinale*; Berkeley, 1915 (Essig); San Diego, March, 1916; Riverside and Orange, February, 1917: *Chrysanthemum* sp.; Berkeley, 1914 (Essig); October, 1915; Menlo Park, San Mateo County, March, 1915; San Diego, January, 1916; La Jolla, February, 1916; Ontario, January, 1917: *Cytisus proliferus*; Berkeley, 1915 (Essig): *Gnapholium* sp.; Walnut Creek, 1914 (Davidson): *Grindelia cuneifolia*; Walnut Creek, 1915 (Davidson): *Helianthus annuus*; San Francisco Bay region, 1914 (Davidson): *Rumex* sp.; Stanford University, March, 1915: *Salix* sp.; Berkeley, 1915 (Essig): *Senecio* spp.; Stanford University, 1909, 1910, 1914 (Davidson); Santa Paula, 1911 (Essig); Palo Alto, February, 1915.

This is a very common species throughout California, occurring on many host plants, particularly the Compositae. It is found most commonly in the early spring on asters, marigolds, and chrysanthemums in southern California, and on German ivy and amsinckia in the San Francisco Bay region. For sometime it was believed to be *Aphis bakeri* Cowen, but its variety of host plants so widely different from those of *bakeri*, led to its being identified as a distinct species. It is one of the most common in the state, as a glance at the collection records will show.

147. *Aphis setariae* Thomas

Figures 246, 247

Thomas, Ill. Lab. Nat. Hist., Bull. 2, p. 5, 1878 (orig. desc.).

Williams, Univ. Neb. Studies, vol. 10, p. 141, 1910 (desc.).

Record.—*Prunus domestica*; San Francisco Bay region (Davidson).

In some parts of the country this plum louse becomes abundant enough to cause serious damage, but it has never been observed to be so in California. Davidson writes that he has found it sparingly a few times in the San Francisco Bay region. The author has never collected it, but has had access to specimens from Morrison, taken in Indiana.

148. *Aphis spiraeicola* Patch

Patch, Maine Agr. Exp. Sta., Bull. 233, p. 270, 1914 (orig. desc.).

Records.—*Spiraea* spp.; Stanford University, 1912 (Morrison); Walnut Creek, Contra Costa County, 1916 (Davidson).

In the San Francisco Bay region there is a small aphid very similar to *Aphis pomi* De Greer found attacking meadowsweet. Davidson and Morrison, who have both observed it, believe it to be this species. The following brief descriptive notes are from alate females

taken by Dr. Patch on cultivated spiraea in Orono, Maine. These notes are included here as there is no adequate description of this species, the only ones¹⁸ being very meager notes indeed.

Alate viviparous females.—Body rather long and narrow, head normal with no antennal tubercles. Antennae shorter than body, reaching to about the base of the fourth abdominal segment. VI spur the longest segment, followed by III, which is about two-thirds as long. Following III are IV, V, and VI base. The usual primary sensoria are present on V and VI, and the accessory sensoria on VI. The secondary sensoria are fairly large and circular. There are six or seven in an even line along the whole length of III. On IV there may be one or two near the middle, or there may be none. Prominent lateral tubercles are present on the prothorax and on the first and seventh abdominal segments. The cornicles are fairly long, slender, and taper slightly toward the apex. They are from one and one-half to two times as long as the hind tarsi, and subequal to or very slightly longer than the cauda. The cauda is fairly long, ensiform, slightly constricted before the tip. The wings are normal, with the second branch of the third discoidal nearer the apex of the wing than the base of the first branch.

Measurements: Body length, 1.19 to 1.33 mm.; width of thorax, 0.544 to 0.561 mm.; antennae total, 0.85 to 0.918 mm.; III, 0.17 to 0.1785 mm.; IV, 0.136 to 0.153 mm.; V, 0.1275 to 0.1445 mm.; VI, base 0.0935 to 0.102 mm.; VI, spur 0.238 to 0.255 mm.; cornicles, 0.1785 to 0.187 mm.; cauda, 0.17 mm.; hind tarsus, 0.102 mm.; wing length, 1.97 to 2.04 mm.; width, 0.748 to 0.782 mm.; expansion, 4.55 mm.; from base of first branch of third discoidal to wing tip, 0.578 to 0.68 mm.; from base of second branch to wing top, 0.17 to 0.255 mm.

149. *Aphis tetrapteralis* Cockerell

Cockerell, South. Cal. Acad. Sci., Bull. 1, p. 4, 1902 (orig. desc.).

Record.—*Atriplex canescens tetraptera*; La Jolla (Cockerell).

This species has been observed but once, when described by Cockerell. He writes: "It differs from *Aphis atriplices* Linn. by its smaller size, mode of life, and shorter cornicles. It seems to be related to *Aphis monardae* Oestlund." In 1916 the author spent considerable time hunting for this species in the vicinity of La Jolla, but in vain.

¹⁸ Patch, Edith M., Maine Aphids of the Rose Family. Maine Agr. Exp. Sta., Bull. 233, p. 270, 1914, *Aphis spiraeicola* n.n.; Gillette, C. P., Plant louse notes, Family Aphididae. Jour. Econ. Ent., vol. 3, p. 404, 1910. *Aphis spiraeella* Schout.

150. *Aphis viburnicolens* n.sp.

Records.—*Viburnum tinus*; Riverside, February to May, 1917; Redlands, February, 1917; Orange, February, 1917: *Laurus rotundifolia*, Riverside, March, 1917.

In the early spring there is a small green and black aphid that attacks in great numbers the racemes of laurustinus and laurel in Southern California. In fact, it is so abundant at times as to seriously injure the plants by preventing them from flowering. The leaves and buds are very sticky and covered with the sooty mold fungus. During April, 1917, all the aphids left the laurel and laurustinus, but the alternate host has as yet not been observed. Specimens were sent to Gillette and Patch for determination, but neither could identify them. Dr. Patch wrote as follows:

This insect is not *spiraecola*, a slide of which I am sending you.

<i>spiraecola</i>	sp.
Cornicles longer than III	Cornicles shorter than III
VI spur longer than III	VI spur subequal to III
VI spur longer than IV and V	VI spur subequal to IV and V
IV subequal to V	IV longer than V

I do not know this species. I do not have *spiraecella* Schout. for comparison.

Gillette stated concerning this species: "This is a species of *Aphis* close to, but almost certainly distinct from, *spiraecella* Schout., and so far as we know, may be new."

From this it would appear that the species from laurustinus and laurel is a new species, and it is described herewith as such.¹⁹ Cotype specimens are in the author's private collection, in the collection of the University of California in Berkeley, and of the Citrus Experiment Station in Riverside.

Alate viviparous female.—Prevailing color green. Head and thorax dusky brown to black. Antennae dusky to black. Beak light brown with tip black. Tibiae, femora of fore legs, and basal one-half of femora of middle and hind legs brown; tarsi, tips of tibiae, tips of fore femora, and apical one-half of middle and hind femora black. Abdomen pale to apple green, sometimes with a few dusky marginal spots. Cornicles and cauda black.

¹⁹ The species reported by Davidson (Jour. Econ. Ent., vol. 3, p. 377, 1910) as *Aphis mali* Fabr. from *Laurus laurustinus* (*Viburnum tinus*?) and by Essig (Injurious and Beneficial Insects of California, Mon. Bull. Cal. Comm. Hort., Supp. vol. 4, p. xlv, 1915) as *Aphis pomi* De Geer from laurustinus, are probably this species.

Head normal, with frontal and antennal tubercles absent. Antennae short, reaching only to the second abdominal segment. III and VI spur subequal; IV and V subequal and about three-fourths as long as III or VI spur. The usual primary sensoria are present on V and VI, and the accessory sensoria on VI. Secondary sensoria are found on III and IV, from five to nine on the former and from one to four on the latter. Cornicles short, subcylindrical, and tapering from base toward apex. Cauda fairly long, ensiform, with a slight constriction in the middle. the cauda is slightly longer than the hind tarsi, and the cornicles a little longer than the cauda. Lateral tubercles are present on the prothorax, and on the first, fourth, and seventh abdominal segments. The cornicles are subequal to IV or V. The hind tarsi are somewhat longer than VI base. The wings are fairly large, with regular venation, the second joint of the third discoidal arising about half way between the tip of the wing and the base of the first joint.

Measurements: Body length, 1.214 to 1.479 mm. (av. 1.372 mm.); width of thorax, 0.476 to 0.578 mm. (av. 0.5338 mm.); antennae total, 0.733 to 0.918 mm. (av. 0.8925 mm.); III, 0.187 to 0.230 mm. (av. 0.2067 mm.); IV, 0.136 to 0.161 mm. (av. 0.1473 mm.); V, 0.119 to 0.153 mm. (av. 0.1416 mm.); VI, base 0.085 to 0.102 mm. (av. 0.0877 mm.); VI, spur 0.204 to 0.230 mm. (av. 0.216 mm.); cornicles, 0.127 to 0.153 mm. (av. 0.1422 mm.); cauda, 0.110 to 0.136 mm. (av. 0.1252 mm.); hind tarsi, 0.102 to 0.119 mm. (av. 0.1023 mm.); wing length, 1.921 to 2.397 mm. (av. 2.167 mm.); width, 0.799 to 0.935 mm. (av. 0.8704 mm.); expansion, 4.42 to 5.304 mm. (av. 4.875 mm.).

Apterous viviparous female.—General color green with the following dusky to black: head, antennae, apex of beak, cornicles, cauda, distal margin anal plate, tarsi, and tips of tibiae. Legs, except tarsi and tips of tibiae, dusky brownish green. Antennae reach to the base of the second abdominal segment. The various segments are proportionally the same as in the alates. The beak reaches to the distal margin of the first coxae or almost to the apical margin of the third coxae. Lateral body tubercles are present on the prothorax and first, second, and seventh abdominal segments. Sometimes they are also present on the third, fourth, or fifth abdominal segments as well. The cornicles and cauda are subequal, each slightly longer than the hind tarsi, and of the same form as in the alates.

Measurements: Body length, 1.326 to 1.462 mm. (av. 1.3685 mm.); width of thorax, 0.595 to 0.68 mm. (av. 0.6975 mm.); antennae total

0.731 to 0.782 mm. (av. 0.748 mm.); III, 0.153 to 0.187 mm. (av. 0.170 mm.); IV, 0.119 to 0.136 mm. (av. 0.1224 mm.); V, 0.119 mm.; VI, base 0.085 mm.; VI, spur 0.136 to 0.1995 mm. (av. 0.1632 mm.); cornicles, 0.153 to 0.1995 mm. (av. 0.170 mm.); cauda, 0.136 to 0.170 mm. (av. 0.162 mm.); hind tarsi, 0.102 to 0.119 mm. (av. 0.114 mm.).

151. *Aphis yuccae* Cowen

Figures 303 to 305

Cowen, Colo. Agr. Exp. Sta., Bull. 31, p. 122, 1895 (orig. desc.).

Williams, Univ. Neb. Studies, vol. 10, p. 145, 1910. *Aphis yuccicola* n.sp. (desc.).

Records.—*Yucca mohavensis*; Moorpark, Ventura County, April, 1916 (F. M. Trimble); San Diego, May, 1916.

In April, 1916, Horticultural Inspector F. M. Trimble of Ventura County sent the author a few specimens of the alate and apterous viviparous females of this species, taken on Spanish dagger in Moorpark. In the latter part of the next month the author found a few apterae on the leaves of Spanish dagger in Golden Hill Park, San Diego. There were only a few individuals present at that time, but there was evidence of an earlier heavy infestation. Following are a few notes to supplement Williams' excellent description of this species.

III is the longest segment of the antennae, followed by VI spur, which is about three-fourths as long. IV is next, being a little over one-half as long as III and about five-sixths as long as VI spur. V is slightly shorter than IV and is followed closely by VI base, which is about one-half the length of the spur. The usual primary sensoria are present on V and VI and the accessory sensoria on VI (fig. 303). The apterae have no secondary sensoria, while the alates along the whole length of III (fig. 304) have about twenty-five irregularly placed sensoria of irregular size. VI is without sensoria. Lateral tubercles are present on the prothorax and on the first and seventh abdominal segments. The cornicles (fig. 305) are long and slightly tapering, being but slightly shorter than the spur of the sixth antennal segment and about twice as long as the hind tarsi. The cauda (fig. 305) is ensiform or sickle-shaped and about three-fourths as long as the cornicles. In length it is about equal to the fifth antennal segment and one-half again as long as the hind tarsi.

Alate viviparous females.—Measurements: Body length, 1.78 to 1.9 mm. (av. 1.86 mm.); width, (thorax), 0.95 mm.; antennae total, 1.38 to 1.51 mm. (av. 1.449 mm.); III, 0.34 to 0.425 mm. (av. 0.391 mm.); IV, 0.238 to 0.273 mm. (av. 0.256 mm.); V, 0.212 to 0.229 mm. (av. 0.219 mm.); VI, 0.136 to 0.17 mm. (av. 0.155 mm.); spur, 0.255 to 0.306 mm. (av. 0.289 mm.); cornicles, 0.255 to 0.2975 mm. (av. 0.275 mm.); cauda, 0.2125 to 0.238 mm. (av. 0.225 mm.); hind tarsi, 0.153 mm.; wing length, 3.06 to 3.4 mm. (av. 3.19 mm.); wing width, 1.27 to 1.46 mm. (av. 1.338 mm.); wing expansion, 7.48 mm.

30. Genus **Toxoptera** Koch.

Koch, Die Pflanzenläuse, p. 253, 1857. Type *Aphis aurantii* Fonsc.

152. **Toxoptera aurantii** (Fonsc.)

Figures 114, 163, 276

Boyer de Fonscolombe, Ann. Ent. Soc. France, vol. 10, 1841. *Aphis* (orig. desc.).

Essig, Pom. Jour. Ent., vol. 3, p. 601, 1911. *T. aurantiae* Koch (desc.).

Davis, U. S. Dept. Agr., Bur. Ent., Tech. Ser., Bull. 25, pt. 1, p. 8, 1912.

Records.—*Citrus* spp.; throughout citrus sections of southern and central California (Essig, author); San Jose (Davidson).

This is the common black louse of the citrus trees, and is found at almost any time of the year on the younger and more tender leaves of various species of *Citrus*. It is more or less heavily preyed upon by the braconid fly, *Lysiphlebus testaceipes* Cresson. In fact, the author has noticed several infestations in which fully ninety-five per cent of the individuals were parasitized. Besides these the syrphid flies cause great havoc among colonies. Of these the author has reared *Allograpta obliqua* Say from a colony taken in the vicinity of El Cajon, San Diego County. Never does this species become abundant enough to seriously damage trees, due undoubtedly to the effective work of its predacious and parasitic enemies. Only in the spring are they found to any great extent, although occasionally throughout the year small infestation can be noticed.

31. Genus **Hyalopterus** Koch

Koch, Die Pflanzenläuse, p. 17, 1854. Type *Aphis arundinis* Fabricius (*A. pruni* Fabr.).

153. **Hyalopterus arundinis** (Fabr.)

Figures 181, 185, 186

- Fabricius, Ent. Syst., vol. 4, p. 212, 1749. *Aphis* (orig. desc.).
 Clarke, Can. Ent., vol. 35, p. 247, 1903 (list).
 Davidson, Jour. Econ. Ent., vol. 2, p. 303, 1909 (list).
 Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910 (list).
 Essig, Mon. Bull. Cal. Comm. Hort., vol. 2, p. 569, 1913 (list).
 Essig, Mon. Bull. Cal. Comm. Hort., vol. 3, p. 624, 1913. *A. prunifoliae* Fitch (list).
 Weldon, Mon. Bull. Cal. Comm. Hort., vol. 2, p. 630, 1913 (list).
 Weldon, Mon. Bull. Cal. Comm. Hort., vol. 3, p. 378, 1914 (list).
 Patch, Maine Agr. Exp. Sta., Bull. 233, 266, 1914 (desc.).
 Davidson, Mon. Bull. Cal. Comm. Hort., vol. 6, p. 64, 1917 (note).

Records.—*Prunus* spp., *Phalaris arundinacea*, *Phragmites communis*, *Typha latifolia*; central California.

During the spring and early summer of the year this "mealy-plum louse" is often very abundant on various species of *Prunus* in the central part of the state, especially in the San Francisco Bay region and the Sacramento Valley. As summer continues all the aphids desert the plum for other host plants, where they remain until fall. The summer hosts in California so far known are reed grass, canary grass, and tule, or cat-tail rush. In the Santa Clara Valley there is a feeling among the prune growers that this aphid is the cause of the splitting of the prunes, which is often quite extensive. However, this remains to be proven.

32. Genus **Liosomaphis** Walker

Walker, The Zoologist, p. 1119, 1868. Type *Aphis berberidis* Kalt.

154. **Liosomaphis berberidis** (Kalt.)

Figures 184, 251, 252

- Kaltenbach, Monog. d. Pflanzenläuse, p. 85, 1843. *Aphis* (orig. desc.).
 Davis, Ann. Ent. Soc. Am., vol. 1, p. 254, 1908. *Rhopalosiphum* (desc.).
 Davidson, Jour. Econ. Ent., vol. 3, p. 378, 1910. *Rhopalosiphum* (list).

Records.—*Berberis vulgaris*; Stanford University (Davidson); February to May, 1915; Berkeley, June to August, 1915.

This species is found throughout the year on the lower sides of the leaves of barberry in the San Francisco Bay region. The apterae are often very abundant, but the alates are always quite scarce. This

species is similar to species of *Rhopalosiphum*, particularly in the shape of the cornicles and cauda, but owing to the absence of antennal tubercles it falls into the tribe Aphidini instead of Macrosiphini. Hence Walker's genus *Liosomaphis* is maintained for this species.

33. Genus **Siphocoryne** Passerini

Passerini, Gli Afidi, 1860. Type *Aphis pastinacae* Linn. (*xylostei* Schrank).

There has been much diversity of opinion concerning this genus, some aphidologists considering it as *Siphocoryne* Passerini, some as *Hyadaphis* Kirkaldy, and some as a synonym of *Rhopalosiphum* Koch. This last is incorrect as this is most certainly not a Macrosiphini for the antennal tubercles are lacking. In 1904 Kirkaldy proposed the name *Hyadaphis* to replace *Siphocoryne*, but in the author's opinion this is uncalled for, so he maintains the original name, *Siphocoryne* Passerini.

There have been reported from various parts of California eight species of *Siphocoryne* as follows: *capreae* (Fabr.), *conii* (Dvdn.), *foeniculi* (Schrank), *nymphaeae* (Linn.), *pastinacae* (Linn.), *salicis* (Monell), *umbellulariae* (Dvdn.), and *xylostei* (Schrank). There are, however, really but three species; *capreae* (Fabr.), *nymphaeae* (Linn.) and *pastinacae* (Linn.). According to Gillette,²⁰ *S. salicis* Monell is a synonym of *S. capreae* (Fabr.), and *xylostei* (Schr.) of *pastinacae* (Linn.). Davidson²¹ states that *S. conii* (Dvdn.) is a synonym of *xylostei* (Schr.), and therefore it is the same as *pastinacae* (Linn.). Morrison writes that the specimens Davidson called *S. foeniculi* (Schr.) are *capreae* (Fabr.), and those he described as *Hyadaphis umbellulariae* n.sp. are *S. pastinacae* (Linn.). These two species, *pastinacae* (Linn.) and *capreae* (Fabr.), have been greatly confused but Gillette²² has worked out their synonymy quite satisfactorily. The following key for distinguishing them is from his paper.

Joints 4, 5, 6, and antennal spur subequal, the spur usually distinctly the longest, cornicles fully three-fourths as long as third joint of the antenna, a small tubercle on the alate form and a large one on the apterous individuals always present**capreae**

²⁰ Gillette, C. P., Two *Rhopalosiphum* species and *Aphis pulverulens* n.sp., Jour. Econ. Ent., vol. 4, pp. 320-325, 1911.

²¹ Davidson, W. M., Plant louse notes from California, Jour. Econ. Ent., vol. 7, p. 133, 1914.

²² Gillette, C. P., Two *Rhopalosiphum* species and *Aphis pulverulens* n.sp., Jour. Econ. Ent., vol. 4, pp. 320-325, 1911.

Joint 6²³ of the antenna distinctly shorter than 5, the fourth still shorter and its spur nearly as long as joints 4, 5, and 6 combined, cornicles seldom much exceeding one-half the third joint of the antenna in length, and a supra-caudal tubercle or spine entirely absent **pastinacae**

Aphis nymphaeae Linn. has usually been considered by American aphidologists as a species of *Rhopalosiphum*, but the presence of lateral body tubercles, the short, robust body, and the absence of antennal tubercles place it in the Aphidini rather than the Macrosiphini. Therefore, it must be considered as belonging to this genus. Baker²⁴ has recently recognized it as belonging here.

KEY TO CALIFORNIAN SPECIES

1. A small spine or tubercle present at the distal end of the body just above the cauda (figs. 255, 256) **capreae** (Fabr.)
- No supra-caudal tubercle or spine 2
2. General color pale green. VI spur as long as IV, V and VI base combined. Cornicles at most but slightly more than one-half the length of III. **pastinacae** (Linn.)
- General color dark brown, wine, or black. VI spur not as long as IV, V and VI base combined, although longer than any two together. Cornicles and III subequal **nymphaeae** (Linn.)

155. *Siphocoryne capreae* Fabr.

Fabricius, Ent. Syst., p. 211, 1794. *Aphis* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 252, 1903. *S. foeniculi* (Pass.) (list).

Davidson, Jour. Econ., vol. 2, p. 303, 1909. *S. salicis* Monell (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *S. foeniculi* (Pass.), (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *S. salicis* Monell (list).

Essig, Pom. Jour. Ent., vol. 3, p. 534, 1911. *Hyadaphis pastinacae* (Linn.) (desc.).

Records.—*Foeniculum vulgare*; Berkeley and Newcastle (Clarke), Stanford University (Davidson): *Carum* spp.; *Cicuta virosa*; Santa Paula, Berkeley (Essig): *Salix laevigata*; Santa Paula (Essig), Brea Canyon, Los Angeles County, April, 1917; Riverside, May, 1917: *Salix nigra*; Lakeside, San Diego County, April, 1916: *Salix* sp., Stanford University (Davidson).

This species is found more or less abundantly in the spring on the tender shoots and leaves of willows, migrating in early summer to various species of Umbelliferae. It is more common than *S. pastinacae* (Linn.), which species is also found on Umbelliferae in the summer, but which passes the fall, winter, and spring on honeysuckle.

²³ In all the author's specimens, VI is shorter than V, which in turn is shorter than IV, while VI spur is nearly as long as the three together.

²⁴ Baker, A. C. and Quaintance, A. L. Aphids injurious to orchard fruits, currant, gooseberry and grape, U. S. Dept. Agr., Farmers' Bulletin 804, p. 21, 1917.

156. *Siphocoryne nymphaeae* Linn.

Figure 172

Linnaeus, Syst. Nat., vol. 2, p. 734, 1735. *Aphis* (orig. desc.).Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *Rhopalosiphum* (list).Essig, Pom. Jour. Ent., vol. 4, p. 793, 1912. *Rhopalosiphum* (desc.).Davidson, Mon. Bull. Cal. Comm. Hort., vol. 6, p. 65, 1917. *Rhopalosiphum* (note).

Records.—*Polygonum* sp., *Alisma* sp., *Potamogeton* sp.; San Francisco Bay region (Davidson): *Typha latifolia*; Santa Paula (Essig), San Francisco Bay region (Davidson): *Nymphaea* sp.; San Francisco Bay region (Davidson), Fresno, June, 1915: *Prunus domestica*; Berkeley, 1916 (Essig).

This aphid occurs throughout the summer months on various semi-aquatic plants, lily, tule, and so forth. In the fall it migrates to plum, where eggs are laid. The first two or three generations in the spring occur on plum, but about June there is a migration to its summer host plants. So far it has been found in southern California only in Ventura County.

The species listed as *Aphis prunorum* Dobr. (see no. 140) may be this species. Essig believes it is, but the author is not certain so does not list it as a synonym.

157. *Siphocoryne pastinacae* Linn.

Figures 266 to 270

Linnaeus, Syst. Nat., p. 451, 1735. *Aphis* (orig. desc.).Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909. *S. xylostei* (Schr.) (list).Davidson, Jour. Econ. Ent., vol. 2, p. 304, 1909. *S. conii* n.sp. (desc.).Davidson, Jour. Econ. Ent., vol. 3, p. 377, 1910. *S. xylostei* (Schr.) and *S. conii* Dvdn. (list).Davidson, Jour. Econ. Ent., vol. 4, p. 599, 1911. *Hyadaphis umbellulariae* n.sp. (desc.).Davidson, Pom. Jour. Ent., vol. 3, p. 399, 1911. *S. conii* Dvdn. (list).Davidson, Jour. Econ. Ent., vol. 7, p. 133, 1914. *S. xylostei* (Schr.) (list).

Records.—*Lonicera* sp.; Stanford University (Davidson), Claremont (Essig), Berkeley, April, 1915: *Umbellularia californica*; San Jose (Davidson): *Conium maculatum*; Stanford University, Penryn, Placer County, and San Jose (Davidson).

This aphid occurs on honeysuckle during the winter and spring, and on various semiaquatic plants in the summer. It has been taken in southern California, in the San Francisco Bay region, and in the Sacramento Valley.

34. Genus **Myzaphis** Van der Goot

Van der Goot, Zür Systematik der Aphiden, Tijdschrift voor Entomologie, vol. 56, p. 96, 1913. Type *Aphis rosarum* Walker.

The author believes that this genus of Van der Goot's should be accepted for the two following species: *Aphis abietina* Walker and *Aphis rosarum* Walker. *A. rosarum* has usually been considered as belonging to the genus *Myzus*, but the absence of antennal tubercles excludes it from that genus (see figs. 306-308, 313). The cornicles and cauda are not typical of *Aphis*, and these together with the distinctive frontal tubercle on the head and the absence of lateral body tubercles distinguish it from *Aphis*. Consequently this genus should be recognized. Following is a key for separating the two known species, both of which occur in California:

Cornicles slightly clavate (figs. 312, 315), shorter than III. III tuberculate, IV without sensoria (fig. 309). Found on *Rosa* spp. **rosarum** (Walker)
 Cornicles cylindrical (fig. 197), equal to or longer than III. III with 9 to 12 rather large secondary sensoria, IV with 1 to 4 (fig. 196). On conifers. **abietina** (Walker)

158. **Myzaphis abietina** (Walker)

Figures 196, 197

Walker, Ann. Mag. Nat. Hist., vol. 3, p. 301, 1848. *Aphis* (orig. desc.).

Wilson, Proc. Ent. Soc. Brit. Columbia, June, 1915 (desc.).

Record.—*Picea excelsa*; San Francisco, March, 1915 (Compere).

The only report of this species in America is that of Wilson, who found it on spruce (*Picea* sp.) at Vancouver, British Columbia. On March 26, 1915, Harold Compere of San Francisco took a number of specimens of this species on the twigs of Norway spruce (*Picea excelsa*) in Golden Gate Park, San Francisco. The specimens are in Essig's and the author's collections.

159. **Myzaphis rosarum** (Walker)

Figures 308 to 317

Walker, Ann. Mag. Nat. Hist., vol. 3, 1848. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 379, 1910. *Myzus* (list)

Records.—*Rosa* spp.; Stanford University (Davidson); Santa Paula (Essig), San Diego, March to July, 1916.

This species has been reported in the San Francisco Bay region by Davidson and in Santa Paula by Essig. In the Bay region it is rather scarce and is second to *Macrosiphum rosae* (Linn.) in abundance on roses. The author has taken it at Stanford University in 1915, and in San Diego several times in 1916. In San Diego in 1916 it was by far the most abundant rose-infesting aphid. The author

has observed it in such numbers on roses as to cover the undersides of practically all the leaves and the calyx cups of the flowers. In some cases the buds were stunted and the flowers unshapely from its effect. In the rose garden of the Panama-California International Exposition these aphids were of considerable importance, necessitating continual care to keep them under control.

Since there is no adequate description of this species in the American aphid literature the author describes it herewith. The following description was drawn from ten specimens of alate and eight of apterae, collected in Santa Paula, Stanford University, and San Diego.

Alate viviparous female.—Color notes (taken from notes made at the time of collection of specimens at Stanford in March, 1915): Head, antennae, and thoracic plates black. Abdomen pale apple green with smoky blotch on dorsum. Legs: apical two-thirds of femora smoky, basal one-third pale, tibiae pale except dusky tip, tarsi dusky. Cornicles green (dusky), cauda pale apple green.

Head is twice as wide as long with a fairly distinct tubercle on the front (fig. 308). Antennal tubercles are lacking or very indistinct. Antennae reach almost to the base of the third abdominal segment (figs. 309, 310). III is the longest segment, followed by IV, spur, V, and VI. The spur and IV are practically equal. Of sixteen antennae examined, in three, the spur and IV were equal, in ten, IV was slightly longer than the spur, while in three, the spur was slightly longer than IV. V is slightly shorter than the spur, and VI slightly shorter than V. However, IV, spur, V, and VI are all almost equal. On V and VI are the usual primary sensoria, and VI the accessory sensoria (fig. 300). III is tuberculate, being furnished with a large number of irregularly placed secondary sensoria (fig. 309). IV is without any sensoria. The beak reaches almost to the second coxae.

The prothorax is without lateral tubercles. The wings are normal, being about twice the length of the body. The second branch of the cubitus arises nearer the apex of the wing than the base of the first branch (fig. 311). In but one of seventeen specimens examined was the origin of the second branch of the cubitus nearer the base of the first branch than the tip of the wing. In this specimen the measurements were: 0.561 mm. from tip of wing to base of first branch and 0.289 mm. from tip of wing to base of second branch.

The abdomen is long and narrow and is without lateral body tubercles. The cornicles (fig. 312) are long, being but slightly shorter than the third antennal segment, and over twice as long as the hind tarsi. They are slightly clavate on the inner side. The cauda (fig.

312) is long and pointed (ensiform), being slightly more than one-half as long as the cornicles and about one-half as long again as the hind tarsi.

Measurements: Body length, 1.19 to 1.41 mm. (av. 1.28 mm.); width of thorax, 0.459 to 0.527 mm. (av. 0.487 mm.); antennae total, 0.85 to 1.156 mm. (av. 1.027 mm.); III, 0.255 to 0.34 mm. (av. 0.317 mm.); IV, 0.1275 to 0.2295 mm. (av. 0.1768 mm.); V, 0.119 to 0.17 mm. (av. 0.1365 mm.); VI, 0.085 to 0.119 mm. (av. 0.1095 mm.); spur, 0.119 to 0.204 mm. (av. 0.1695 mm.); cornicles, 0.238 to 0.306 mm. (av. 0.2574 mm.); cauda, 0.136 to 0.187 mm. (av. 0.1588 mm.); hind tarsi, 0.119 to 0.136 mm. (av. 0.1205 mm.); wing length, 2.482 to 2.72 mm. (av. 2.5483 mm.); wing width, 0.884 to 1.02 mm. (av. 0.9396 mm.); wing expansion 5.423 to 5.967 mm. (av. 5.5836 mm.). From tip of wing to base of first branch of cubitus 0.561 to 1.037 mm. (av. 0.8041 mm.); from tip of wing to base of second branch of cubitus, 0.17 to 0.34 mm. (av. 0.2907 mm.).

Apterous viviparous female.—Head about as long as broad with a large prominent tubercle on the front, this tubercle being considerably larger than in the alate form; in some individuals it is fully as large as the first antennal segment (fig. 313). Antennal tubercles small but distinct, similar to those of the alate. Antennae (fig. 314) short, reaching only to the third coxae. III is the longest segment, followed by the spur, IV, VI, and V. These are all subequal, the formula of the averages being spur, IV, VI, and V. The formulae for seven antennae are S, VI (V, IV); S, (VI, V, IV); S, V, IV, VI; S, IV (V, VI); S, (IV, V), VI; IV (V, VI, S); (S, VI, IV), V. The usual primary sensoria are present, but there are no secondary sensoria. The beak is short, reaching only to the second coxae.

The prothorax is without tubercles. The thorax is normal, as are the legs. The abdomen is long and narrow, without lateral tubercles, and without long capitate hairs as found in some species of *Myzus*. The cornicles (fig. 315) are long, cylindrical, and slightly tapering toward the apex, or slightly clavate at apex. They are over twice as long as the third antennal segment and over three times as long as the hind tarsi (fig. 317), and half as long again as the cauda. The cauda (fig. 316) is long and ensiform, being slightly more than twice the length of the hind tarsi, and about two-thirds the length of the cornicles.

Measurements: Body length, 1.275 to 1.615 mm. (av. 1.428 mm.); width of thorax, 0.493 to 0.748 mm. (av. 0.6375 mm.); antennae total, 0.544 to 0.731 mm. (av. 0.6239 mm.); III, 0.153 to 0.238 mm. (av.

0.178 mm.); IV, 0.068 to 0.119 mm. (av. 0.0855 mm.); V, 0.068 to 0.102 mm. (av. 0.0833 mm.); VI, 0.068 to 0.119 mm. (av. 0.085 mm.); spur, 0.085 to 0.136 mm. (av. 0.117 mm.); cornicles, 0.306 to 0.442 mm. (av. 0.3655 mm.); cauda, 0.204 to 0.272 mm. (av. 0.2338 mm.); hind tarsi, 0.102 mm. (Note: no color notes were taken of the apterae at the time of collection and as all the specimens were killed in alcohol, dehydrated in xylene and mounted in Canadian balsam, it is impossible to give any color notes.)

35. Genus *Coloradoa* Wilson

Wilson, Ann. Ent. Soc. Am., vol. 3, p. 323, 1910. Type *Aphis rufomaculata* Wilson.

This genus was described by Wilson in 1910 to contain the species *Aphis rufomaculata* Wilson. After examining specimens of this species recently, the author is of the opinion that *Coloradoa* and *Myzaphis* are synonymous, for there does not seem to be enough difference between this species and the two species of *Myzaphis* to warrant a separation of genera. However, the author does not feel certain concerning the point, so lists both these genera. Should they later prove to be synonymous, *Myzaphis* would have to be dropped and replaced by *Coloradoa*. There is but one species belonging to this genus.

160. *Coloradoa rufomaculata* Wilson

Wilson, Ent. News, vol. 14, p. 261, 1908. *Aphis* (orig. desc.).

Record.—Chrysanthemum, cultivated; Sacramento, April, 1917 (Davidson).

The author has recently received specimens of this species from Davidson taken on chrysanthemum in Sacramento.

36. Genus *Cerosipha* Del Guercio

Del Guercio, Nove relazione agraria di Firenze, vol. 2, p. 116, 1909. Type *C. passeriniana* n.sp.

161. *Cerosipha cupressi* Swain

Swain, Trans. Am. Ent. Soc., vol. 44, p. 19, 1918 (orig. desc.).

Records.—*Cupressus guadelupensis*; San Diego, 1916; Riverside, 1917; *C. macrocarpa*, San Diego, 1916.

This species, recently described by the author, has been taken by him several times in San Diego and Riverside on blue cypress and Monterey cypress. It is an extremely interesting little aphid, differing considerably from any other species known to the author, both in habits and appearance. Its five-jointed antennae, long cauda, atrophied cornicles, and convexity of abdomen are quite distinctive.

Subfamily **Pemphiginae** Mordwilko²⁵

Mordwilko, Ann. Mus. Zool. Imp. Acad. Sci. St. Petersburg, vol. 13, pp. 362-364, 1908.

A summary of Mordwilko's description of this subfamily has already been given. The latest and probably the most complete systematic work on this subfamily that has been done is that of Dr. Albert Tullgren of Stockholm, Sweden, in his paper, "Aphidologische Studien I" in 1909. Tullgren divides this subfamily into six tribes, viz: Vacunina, Hormaphidina, Mindarina, Pemphigina, Schizoneurina, and Anoeciina. In the tribe Vacunina he places *Vacuna* Heyden and *Glyphina* Koch; in Hormaphidina is the one genus *Hamamelistes* Shimmer; in Mindarina is the one genus *Mindarus* Koch; in Pemphigina he places *Asiphum* Koch, *Pachypappa* Koch, *Prociphilus* Koch, *Thecabius* Koch, and *Pemphigus* Hartig; in Schizoneurina he places the two genera, *Schizoneura* Hartig, and *Tetraneura* Hartig; and finally in the Anoeciina is found the one genus *Anoecia* Koch. It can be seen that he uses several of Koch's genera which have not heretofore been generally used, namely: *Prociphilus* Koch, *Thecabius* Koch, *Asiphum* Koch, and so forth. Lately there has been a tendency among American aphidologists to accept these genera, and thus to divide up the larger genus *Pemphigus* into these smaller ones. Mordwilko in his keys divides this subfamily into four groups, namely: Hormaphidina, Pemphigina, Schizoneurina, and Vacunina. In Hormaphidina he includes besides the genus *Hamamilestes* Shimmer, the genera *Hormaphis* Osten-Sacken and *Cerataphis* Liechtenstein. In Pemphigina he includes *Pentaphis* Heyden, *Tetraneura* Hartig, *Pemphigus* Hartig, *Aploneura* Passerini, *Rhizoctonus* Horvath, and *Paracletus* Heyden. In Schizoneurina he places *Löwia* Liechtenstein, *Colopha* Monell, *Pachypappa* Koch, *Schizoneura* Hartig, *Anoecia* Koch, and *Mindarus* Koch. In Vacunina he includes but the one genus *Vacuna* Heyden, which he does not separate from *Glyphina* Koch.

There is considerable difference in the classifications of these two authors, but as far as we are concerned here in California our genera are placed about the same by both. Following is a translation of Mordwilko's key to the groups:

²⁵ The author has under way a more exhaustive study of this subfamily, particularly of the species of *Pemphigus* and *Prociphilus*. As this research is still in progress, however, it was thought best to omit any report of it, the author here confining himself merely to the records of the presence of the various species in California. It was hoped to have this study completed at the present time, but the unprecedented conditions of this season have made it necessary to delay further study for the time being.

1. Winged forms with a cucurbit-shaped cauda. Nymphs that failed to molt with three-jointed antennae. Winged forms with three to five-jointed antennae, which are coarsely ringed from the third on. Wingless parthenogenetic females presenting the appearance of the larvae of other families, as of some kinds of Coccidae, or of species of *Aleyrodes*. Sexual forms with beaks Group **Hormaphidina**
- Winged forms without distinct cauda. Nymphs that failed to molt with four to five-jointed antennae. Antennae of winged females five-to six-jointed. Sensoria may be found on the third and following joints, often in the form of arches or half rings, but never as complete rings 2
2. Cubitus [third discoidal vein] of the fore wings simple. Cornicles, which are pore or pointlike, present only in some species, and then not in all forms. Group **Pemphigina**
- Cubitus [third discoidal vein] of fore wings once-branched. Cornicles mostly point or pore-like 3
3. Antennae of winged forms six-jointed. Wings held roof-like when at rest. Group **Schizoneurina**
- Antennae of winged forms five-jointed. Wings held flat when at rest. Group **Vacunina**

Group **Hormaphidina** Mordw.

Mordwilko, Ann. Mus. Zool. Imp. Acad. Sci. St. Petersburg, vol. 13, pp. 364-365, 1908.

The antennae of the winged forms are 5- to 3-jointed (?). With the exception of the first two joints they are closely and entirely ringed. Even in the genus *Hormaphis* O.S., where the antennae are 3-jointed, they may probably be considered morphologically as of five joints. The wings are held flat at rest. There are four transverse veins on the fore wings, the third of which [third discoidal] is simple. The first two [first and second discoidals] originate at the same point on the subcosta. The hind wings have one or two transverse veins, in the latter case both originating at the same point. The wingless parthenogenetic females on the alternate host plants (for example on birch) are mostly circular in shape, and have small wax tubes around them. Other forms are coccid-like. The sexual forms have beaks. The cornicles are absent.

This is a description as given by Mordwilko in the above mentioned paper. Below is a key to the genera, as given by Mordwilko and by Van der Goot, the latter of whom includes in this group the two genera *Hamamelestes* Shimmer and *Cerataphis* Licht.

1. Antennae of winged females plainly five-jointed 2
- Antennae of winged females only three-jointed **Hormaphis** O.S.
2. Antennae always five-jointed. Front of head always with two little horns. Third discoidal once-branched **Cerataphis** Lichtenstein
- Antennae of apterous forms three- or four-jointed. Front without horns. Third discoidal simple **Hamamelistes** Shim.

37. Genus **Cerataphis** Lichtenstein

Lichtenstein, Bull. Société ent. de France, vol. 2, p. 16, 1882. Type *Coccus lataniae* Boisd.

162. **Cerataphis lataniae** Boisdual

Boisdual, Ent. Hort., 1867. *Coccus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 5, p. 404, 1912 (list).

Essig, Univ. Calif. Publ. Entom., vol. 1, p. 342, 1917 (list).

Records.—Fern, Stanford University (Davidson); orchid, Oakland (Essig).

This coccid-like species has been reported twice in the San Francisco Bay region, by Davidson and by Essig. Morrison and the author have also taken it on the same ferns on which Davidson found it in the Stanford University nursery.

Group **Pemphigina** Lichtenstein

Below is a key to the California genera of this group, adapted from Mordwilko, Tullgren and Del Guercio. Del Guercio described a genus in 1909 for *Pemphigus radicolola* Essig, which he called *Trifidaphis*.

1. Antennae of alate females five-jointed **Trifidaphis** Del Guer
- Antennae of alate females six-jointed 2
2. Stem mothers with five-jointed antennae. Wax-gland plates on head always present and usually large. Spring and fall migrants with wax-gland plates always on mesothorax and abdomen, and usually on head. Dorsal pores never present 3
- Stem mothers with four-jointed antennae. Head normally without wax-gland plates. Dorsal pores sometimes present. Stem mothers and spring migrants (fundatrix and fundatrigenia) at first live in the same closed galls. **Pemphigus** Hartig
3. Secondary sensoria furnished with hairy fringe (Wimperkranz). Wax-gland plates generally large. In stem mothers there appear four very large pronotal wax-gland plates, placed in a transverse row. All plates have a clearly chitinized border. Stem mother and migrants live together. **Prociphilus** Koch
- Secondary sensoria without hairy fringe (Wimperkranz). Wax-gland plates generally small. In stem mothers there are six pronotal plates, of which the four middle ones are arranged in the form of a trapezium. In the winged fall migrants (sexupara) there are also transverse abdominal gland plates, which are without clearly chitinized borders. Stem mothers and spring migrants live in separate galls **Thecabius** Koch

38. Genus **Trifidaphis** Del Guercio

Del Guercio, Riv. di patal. veg., vol. 3, p. 20, 1909. Type *Pemphigus radicola* Essig.

163. **Trifidaphis radicola** Essig

Essig, Pom. Jour. Ent., vol. 1, p. 8, 1909. *Pemphigus* (orig. desc.).

Baker, Pom. Jour. Ent., vol. 1, p. 74, 1909. (Translation of Del Guercio's description of the genus.)

Essig, Pom. Jour. Ent., vol. 2, p. 283, 1910 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 699, 1912 (list).

Records.—*Amaranthus retroflexus*, *Solanum douglasii*; Claremont, Santa Paula (Essig).

Essig described this species from specimens taken on the roots of *Amaranthus retroflexus* and *Solanum douglasii* in Santa Paula and Claremont. Later Del Guercio described a new genus for this species based on the venation and the antennae. It seems that the type specimen of this species had but five-jointed antennae and so of course it could not belong to the genus *Pemphigus*. On an examination of eight specimens, including the type specimen and seven cotypes, the author finds that the number of joints in the antennae are variable. The type specimens had both antennae with but five joints. Six antennae had but five joints, six had six distinct joints, and four had five joints in which the division into six could be made out. This division was in the third joint at about one-third the distance from the apex. Consequently one could say that this species was typically five-jointed, but with some specimens with the third joint divided into two, or it could be said that it was typically six-jointed, but in some specimens a reduction occurred through the joining of the third and fourth segments. As but a few specimens were examined the author is not willing to state which is the more common, hence leaves this as a valid genus, although he is of the opinion that this really belongs to the genus *Prociphilus* Koch.

39. Genus **Pemphigus** Hartig

Hartig, Jahresb. u. d. Fortschr. d. Forstwiss. u. forstliche Naturk., vol. 1, p. 645, 1837. Type *Aphis bursarius* Linn.

This genus is represented in California by three well known species,²⁶ *P. betae* Doane, *P. populi-caulis* Fitch, and *P. populi-trans-*

²⁶ There has been taken several times a species forming elongate leaf galls on *Populus fremontii*, both in the San Francisco Bay region by Davidson and in San Diego County by the author, that structurally seems to be identical with *P. populi-caulis* Fitch, but its gall is quite distinct, being more or less similar to that of *P. betae* Doane. Further study may reveal the identity of this form.

versus Riley. All of these species, during at least a part of their life cycles, infest various species of *Populus*, where they form more or less distinctive galls.

KEY TO FUNDATRIGENIAE²⁷

1. Secondary sensoria present only on III. Galls formed on leaf petioles, with a transverse opening on the outside of the curve **populi-transversus** Riley
- Secondary sensoria on other segments as well as on III 2
2. Secondary sensoria on III to VI inclusive. Galls formed by the twisting of the petiole with an oblique opening on the inside of the curve.
populi-caulis Fitch
- Secondary sensoria on III and IV.²⁸ Gall formed on the under side of the leaves, being more or less elongate and opening on the upper side.
betae Doane

164. *Pemphigus betae* Doane

Doane, Ent. News., vol. 11, p. 390, 1900 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 248, 1903 (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910 (list).

Williams, Univ. Neb. Studies, vol. 10, p. 92, 1910. *P. balsamiferae* n.sp. (desc. fundatrigenia).

Essig, Pom. Jour. Ent., vol. 4, p. 299, 1912 (list).

Maxson, Jour. Econ. Ent., vol. 9, p. 500, 1916 (note).

Records.—*Beta vulgaris*; San Francisco Bay region, Monterey County, Sacramento Valley. (*Rumex* spp., *Chenopodium* spp., etc.?)

Under the name *P. betae* Doane, Clarke, Davidson, and Essig have reported a species of aphid infesting the roots of sugar beets, dock, *Chenopodium*, and other plants throughout California.

Originally this species was described from specimens taken on sugar beet in Washington, but later²⁹ it was proven that a species forming elongated leaf galls on *Populus balsamifera* in the spring migrated to beets, and was identical with this species. In 1916 Maxson (cited above) states that his investigations point to the fact that in Colorado there are more than one species of *Pemphigus* attacking the sugar beet, one of which is this species that forms the elongate leaf gall on poplar in the spring, and which is known now as *P. betae* Doane.

²⁷ At present only a key to the alate migrants or fundatrigeniae occurring in galls on poplar is given. It is hoped that later, keys to all forms may be formulated. At present, however, the life histories of the species are not sufficiently known.

²⁸ The sexupara or alate migrants from beets to poplars have secondary sensoria on III to V inclusive. These form no galls on poplar, however.

²⁹ Parker, The life history of the sugar-beet root louse, Jour. Econ. Ent., vol. 7, pp. 136-141, 1914;

Gillette, Notes on some Colorado aphids having alternate host plants, Jour. Econ. Ent., vol. 8, p. 97, 1915.

These observations of Maxson's together with those made by the author lead to the conclusion that all the reported cases of infestation of beets and other hosts by *P. betae* Doane in California do not necessarily refer to this species. Never have the fundatrix or fundatrigenia been taken on poplar in California. This strengthens the point that the aphids on beets and other hosts may not all be *P. betae* Doane. Further studies and observations will have to be made before this point can be settled, however.

165. *Pemphigus populicaulis* Fitch

Fitch, Rep. Ins. N. Y., vol. 5, p. 845, 1859 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 248, 1903 (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910. *P. populi-transversus* Riley (list).

Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911. *P. populi-transversus* Riley (list).

Essig, Pom. Jour. Ent., vol. 4, p. 699, 1912 (list).

Essig, Pom. Jour. Ent., vol. 4, p. 708, 1912 (desc.).

Davidson, Jour. Econ. Ent., vol. 8, p. 420, 1915 (sexuales).

Records.—*Populus fremontii*, *P. trichocarpa*; from Placer County to San Diego County (Clarke, Davidson, Essig, Morrison, and the author).

The species infests cottonwoods throughout the state, forming a gall by the twisting of the leaf petiole. The sexuales are found, according to Davidson, under the bark where the eggs are also laid. The author has found the species in San Diego County, having taken the fundatrix, virgogenia, and fundatrigenia in galls in May, 1916, and the dead sexupara at the same time in old galls. These latter probably died without ever leaving the galls.

166. *Pemphigus populi-transversus* Riley

Riley, U. S. Geog. Geol. Surv., Bull. 5, p. 15, 1880 (orig. desc.).

Essig, Univ. Calif. Publ. Entom., vol. 1, p. 343, 1917 (list).

Records.—*Populus fremontii*, Berkeley, September, 1914 (Essig), Riverside September to October, 1916, May to July, 1917.

This species forms large galls on the leaf petioles of poplar somewhat similar to the preceding species, differing in that the opening is on the opposite side of the gall, and is transverse rather than oblique. Essig's specimens were determined by Gillette, the author's by Maxson. Davidson reported a species under this name from Stanford

University, but later wrote the author that he was mistaken in his determination, the species being *P. populicaulis* Fitch instead.

Just recently the author received specimens of the sexupara of this species from J. R. Parker, Bozeman, Montana. These were taken by S. H. Jones in Port Allen, Louisiana, in September, 1915, on the roots of cabbages. Jones notes that cabbage and other cruciferous plants are the alternate host of this species. This spring the author received a large number of apterae of a species of *Pemphigus* taken in Orange County on the roots of cabbage. A specific determination of the species was impossible but it may have been this one.

40. Genus *Thecabius* Koch

Koch, Die Pflanzenläuse, p. 294, 1857. Type *Pemphigus affinis* Kalt.

This genus is very similar to *Prociphilus*, and by some authors, particularly Baker,³⁰ is considered as synonymous. However, for present purposes the author proposes to retain it for the three species included herewith.

KEY TO CALIFORNIAN SPECIES

1. Antennae short, barely reaching to the metathorax, and not one-third as long as the body. III but slightly longer than VI *populi-monilis* Riley
- Antennae longer, reaching beyond the base of the abdomen, and about one-half as long as the body. III considerably longer than VI 2
2. V and VI with secondary sensoria *populi-conduplicifolius* Cowen
- VI without secondary sensoria *californicus* Davidson

167. *Thecabius californicus* (Davidson)

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910. *Pemphigus ranunculi* n.sp. (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 4, p. 414, 1911, renamed *Pemphigus californicus* Dydn.

Essig, Pom. Jour. Ent., vol. 4, p. 699, 1912. *Pemphigus* (desc. ala. and apt. female).

Davidson, Jour. Econ. Ent., vol. 7, p. 127, 1914 (note).

Records.—*Ranunculus californicus*; San Francisco Bay region (Davidson, Morrison, Essig, author): ? *Populus* sp.; Walnut Creek, Contra Costa County, May, 1915 (Davidson): *Fraxinus oregona*; Walnut Creek (Davidson).

This aphid is found quite abundantly on the roots and stems of the small California buttercup in the San Francisco Bay region. According to Davidson there is a migration during April from butter-

³⁰ Baker, A. C., Identity of *Eriosome pyri*, Jour. Agr. Res., vol. 5, p. 1118, 1916.

cup to ash. There may be a migration to poplar as well, for the author has specimens that seem to be this species taken by Davidson on poplar. Gillette³¹ places this species as a synonym of *T. populi-conduplifolius* Cowen, which attacks both *Ranunculus* and *Populus* in Colorado. Davidson, however, is convinced that they are distinct.

168. **Thecabius populiconduplifolius** (Cowen)

Cowen, Colo. Agr. Exp. Sta., Bull. 31, p. 115, 1895. *Pemphigus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910. *Pemphigus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 699, 1912. *Pemphigus* (list).

Gillette, Annals Ent. Soc. Am., vol. 7, p. 61, 1914 (desc. and life history).

Record.—*Populus trichocarpa*; Stanford University (Davidson).

This species was reported by Davidson on poplar at Stanford University. Since then no further records of its occurrence in the state have been made. In Colorado, Gillette finds that the common buttercup, *Ranunculus* sp., is an alternate host and so considers the preceding species as a synonym. This may be possible, but it is quite doubtful.

169. **Thecabius populimonilis** (Riley)

Riley, U. S. Geol. Surv., Bull. 5, p. 13, 1879. *Pemphigus* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910. *Pemphigus* (list)

Davidson, Pom. Jour. Ent., vol. 3, p. 398, 1911. *Pemphigus* (list).

Essig, Pom. Jour. Ent., vol. 4, p. 699, 1912. *Pemphigus* (list).

Gillette, Ann. Ent. Soc. Am., vol. 6, p. 485, 1913 (desc. and life history).

Records.—*Populus* spp.; Tulare and Placer counties (Davidson); Santa Paula (Essig), Riverside, 1916–1917.

Throughout central and southern California this species is found on various species of *Populus* where it forms more or less globular galls on the upper side of the leaves near the margins. In the vicinity of Riverside the young stem mothers began to appear in April (1917). When first observed in September, 1916, nearly all the galls were empty while a few contained alate migrants (sexupara probably). According to Gillette the eggs are laid on the trunks of *Populus*, thus the entire life cycle is passed on the one host plant. This is rather unusual for the Pemphiginae of this section.

³¹ Gillette, C. P., Some Pemphiginae attacking species of *Populus* in Colorado, Ann. Ent. Soc. Am., vol. 7, pp. 61–65, 1914.

41. Genus **Prociphilus** Koch

Koch, Die Pflanzenläuse, p. 279, 1857. Type *Aphis bumeliae* Schrank.

KEY TO CALIFORNIAN SPECIES

1. Stigma of forewings conspicuously darkened. V with a few annular secondary sensoria, VI with or without any. Dorsal thoracic wax plates small and oval **alnifoliae** (Williams)
 — Stigma not conspicuously darkened. V and VI without annular secondary sensoria. Dorsal thoracic wax plates quite large and triangular.
venafuscus Patch

170. **Prociphilus alnifoliae** (Williams)

Williams, Univ. Neb. Studies, vol. 10, p. 91, 1910. *Pemphigus* (orig. desc.).
 Baker, Jour. Agr. Res., vol. 5, p. 1118, 1916 (note).

Records.—*Heteromeles arbutifoliae*; Sespe, Ventura County, March, 1915 (S. H. Essig); May, 1915 (C. P. Clausen).

There has been no record of this species from California heretofore, but the author has specimens taken on California holly or Christmas berry in Sespe Canyon during March and May, 1915, by S. H. Essig and C. P. Clausen.

171. **Prociphilus venafuscus** Patch

Patch, Ent News, vol. 20, p. 319, 1909. *Pemphigus* (orig. desc.).

Essig, Pom. Jour. Ent., vol. 3, p. 553, 1911. *Pemphigus fraxini-dipetalae* n.sp. (orig. desc.).

Essig, Pom. Jour. Ent., vol. 4, p. 699, 1912. *Pemphigus fraxini-dipetalae* Essig (list).

Childs, Mon. Bull. Cal. Comm. Hort., vol. 3, p. 220, 1914. *Pemphigus fraxini-dipetalae* Essig (list).

Wilson, Trans. Am. Ent. Soc., vol. 41, p. 85, 1915. *Prociphilus fraxini-dipetalae* (Essig) (note).

Davidson, Jour. Econ. Ent., vol. 8, p. 421, 1915. *Prociphilus fraxini-dipetalae* (Essig) (list).

Baker, Jour. Agr. Res., vol. 6, pp. 1118–1119, 1916 (desc. notes, synonymy).

Records.—*Fraxinus dipetala*; Santa Paula (Essig), Contra Costa and Santa Clara counties (Davidson); *F. oregona*; Oregon (Wilson); Berkeley, April, 1915: *Aesculus californicus*; Sacramento (Childs); *Pseudotsuga taxifolia*; Oregon (Wilson).

Occasionally this very large aphid is found infesting the leaves of ash in the San Francisco Bay region and in the mountains of southern California. In early summer it leaves the ash, and according to Wilson infests the roots of Douglas fir in Oregon. At one time Leroy Childs found a few specimens on buckeye in the vicinity of Sacramento, but it is probable that these were accidental there.

Group **Schizoneurina** Lichtenstein

This group as considered by Mordwilko contains the following genera: *Löwia* Licht., *Colopha* Monell, *Pachypappa* Koch, *Schizoneura* Hartig, *Anoecia* Koch, and *Mindarus* Koch. Tullgren places in his tribe Schizoneurina the two genera, *Schizoneura* Hartig, and *Tetraneura* Hartig. *Pachypappa* Koch he places in his tribe Pemphigina, and he has a separate tribe for each of the genera *Anoecia* Koch and *Mindarus* Koch, calling them respectively tribe Anoeciina and tribe Mindarina. Below is a translation of Mordwilko's key.

1. Wings laid flat on back when at rest **Löwia** Licht.
- Wings held roof-like when at rest 2
2. Stigma of forewings trapezoidal in shape, reaching only to the beginning of the curve around the end of the wing, never extending to the tip of the wing. Radial vein originating from the posterior exterior corner of the stigma 3
- Stigma linear, very long, reaching to the wing tip on the front side of the wing, and even following the backward curve of the exterior side of the wing to some extent. Radial vein starting almost at the beginning to the interior edge of the stigma. Sexual forms with beaks **Mindarus** Koch
3. Hind wings with one transverse vein **Colopha** Monell
- Hind wings with two transverse veins 4
4. Both transverse veins originating from the same point on the longitudinal veins **Pachypappa** Koch
- Transverse veins of hind wings originating separately 5
5. Bodies of apterous and alate forms with little hair, and covered at least on the dorsum of the abdomen with waxy powder. Cornicles pore-like (point-like). Sexual forms without beaks **Eriosoma** Leach
- Bodies of apterous and alate forms very hairy and not covered with waxy powder or granules (only the stem mothers are weakly pulverulent). Cornicles comparatively large, tuberculate (cone-like). Sexual forms with beaks **Anoecia** Koch

The genera *Löwia* Licht., *Pachypappa* Koch, and *Anoecia* Koch are not represented in California. *Colopha* Monell and *Mindarus* Koch are both represented by their type species. It has been proven that *Eriosoma* Leach has priority over *Schizoneura* Hartig, so that genus is now known by that name. It is represented in California by three or four species at present.

42. Genus **Colopha** Monell

Monell, Can. Ent., vol. 9, p. 102, 1877. Type *Byrsocrypta ulmicola* Fitch.

172. **Colopha ulmicola** (Fitch)

Fitch, Rept. Ins. N. Y., vol. 4, p. 63, 1858. *Byrsocrypta* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909 (list).

Patch, Maine Agr. Exp. Sta., Bull. 181, 196, 1910 (desc.).

Record.—*Ulmus* sp.; Stanford University (Davidson).

Davidson recorded this species from elm at Stanford University in 1909. Since then it has not been found again.

43. Genus **Eriosoma** Leach

Leach, Trans. Hort. Soc. London, vol. 3, p. 54, 1820. Type *Aphis lanigerum* Hausman.

Until quite recently this genus has been known as *Schizoneura* Hartig, but as Baker³² has pointed out, the name *Eriosoma* has priority. In California there are three distinct species represented, with a possible fourth. One of these is known only on elm, one on apple (and elm), and one on pear (and elm).

The following key to the fall migrants is adapted partially from a table of Baker and Davidson.³³

1. Body naked except caudal segment. Distal sensoria of V and VI with fringe. *languinosa* (Hartig)
- Body with some woolly covering. Distal sensoria without fringe 2
2. Wing veins narrow without brown margins. III longer than IV, V, and VI together *lanigerum* (Haus.)
- Wing veins broad with brownish margins. III not so long as IV, V, and VI. *americana* (Riley)

173. **Eriosoma americana** (Riley)

Riley, U. S. Geol. Surv., Bull. 5, p. 4, 1879. *Schizoneura* (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 248, 1903. *Schizoneura* (list).

Patch, Maine Agr. Exp. Sta., Bull. 220, p. 268, 1913. *Schizoneura* (desc. note).

Records.—*Ulmus americana*; Berkeley (Clarke); Walnut Creek, June, 1915 (Davidson); Palo Alto, May, 1915.

This leaf-curling aphid of the American elm is found in the San Francisco Bay region, and in some cases is very abundant. In May

³² Baker, A. C., The woolly apple aphid, U. S. Dept. Agr., Office Sec'y, Report 101, pp. 11-12, 1915.

³³ Baker, A. C., and Davidson, W. M., Woolly pear aphid, Jour. Agr. Res., vol. 6, p. 358, 1916.

and June, 1915, it was especially so on a row of elms on the campus of Stanford University. At that time stem mothers, nymphs, and alate spring migrants were present in the galls. By the last of June all of these had flown away, leaving the galls empty. According to Baker elm is the only host plant of this species.

174. *Eriosoma lanigerum* (Hausman)

- Hausman, Mag. Ins., vol. 1, p. 440, 1802. *Aphis* (orig. desc.).
 Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909. *Schizoneura* (list).
 Davidson, Jour. Econ. Ent., vol. 3, p. 374, 1910. *Schizoneura* (list).
 Baker, U. S. Dept. Agr., Office Sec'y, Report 101, pp. 11-16, 1915 (desc. and biology).

Record.—*Pyrus malus*, throughout the state.

Wherever apple trees are found in the state this woolly aphid is also found; the white masses on the trunks and leaves being very conspicuous, the colonies on the roots more injurious but less conspicuous. In California only the apple has been found to be attacked. The winter is passed by young nymphs on the roots. As the warmer weather of spring comes these migrate up the trunks and out on the branches and twigs. Here they feed throughout the summer. In the fall there is a downward migration, and occasionally a fall migrant is seen. Whether or not these fly to elms as in other parts of the country, is not known, but none have ever been observed on elm.

175. *Eriosoma languinosa* (Hartig)

- Hartig, Zeitschr. Ent., vol. 3, p. 359, 1841. *Aphis* (orig. desc.).
 Baker and Davidson, Jour. Agr. Res., vol. 6, pp. 351-360, 1916. *E. pyricola* n.sp. (desc.).
 Baker and Davidson, Jour. Agr. Res., vol. 10, pp. 65-74, 1917. *E. pyricola* B. & D. (desc. and biology).

Records.—*Pyrus communis*, *Ulmus campestris*; central California.

In 1916 Baker and Davidson described a species of *Eriosoma* that attacks the roots of pears throughout the central part of the state, naming it *E. pyricola*. Later Davidson found that a species common on *Ulmus campestris* was the alternate form of this species. This elm form checks up very favorably with specimens of *E. languinosa* Hartig from Europe, and is undoubtedly identical. Thus the name *pyricola* will have to be dropped in favor of *languinosa*. These elm galls are of a rather peculiar shape, and, as Patch writes, they have the appearance of a bonnet.

44. Genus **Mindarus** Koch

Koch, Die Pflanzenläuse, p. 277, 1857. Type *M. abietinus* n.sp.

176. **Mindarus abietinus** Koch

Koch, Die Pflanzenläuse, p. 278, 1857 (orig. desc.).

Clarke, Can. Ent., vol. 35, p. 248, 1903. *Schizoneura panicola* Thos. (list).

Patch, Maine Agr. Exp. Sta., Bull. 182, p. 242, 1910 (desc.).

Records.—*Pinus radiata*; Berkeley, Palo Alto (Clarke): *Abies cilicia*; Stanford University, May, 1915.

This aphid, easily recognized by the extremely long stigma of the fore wings, has been found in the San Francisco Bay region infesting the shoots of Monterey pine and Cilician fir.

Group **Vacunina** Mordwilko

This group contains but two genera, *Vacuna* Heyden and *Glyphina* Koch. Mordwilko does not recognize *Glyphina* as distinct from *Vacuna*, although Tullgren does. The latter separates the two genera as follows:

1. Last abdominal tergite formed into a knob-shaped tail. Integument bare, and at most partially set with short lancet-shaped hairs. **Vacuna** Heyd.
- Last abdominal tergite half-moon shaped, strongly swollen, but scarcely, if at all, separated from the base. Integument set with stiff bristle-like hairs and in apterous females with grain-like elevations **Glyphina** Koch³⁴

45. Genus **Vacuna** Heyden

Heyden, Ent. Beitr., vol. 2, p. 289, 1837. Type *Aphis dryophila* Schrank.

177. **Vacuna dryophila** (Schrank) (?)

Schrank, Fauna Boica, vol. 1, p. 113, 1801. *Aphis* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 7, p. 128, 1914. *Chaitophorus* sp. (desc.).

Davidson, Jour. Econ. Ent., vol. 10, p. 290, 1917 (desc.).

Record.—*Quercus lobata*; Walnut Creek (Davidson).

Recently Davidson described this species from specimens taken on valley oak in Contra Costa County, where he had observed it for three years. The single alate female he has taken does not appear identical with European specimens of *V. dryophila*, so he lists the species under this name provisionally.

³⁴ This genus is not represented in California.

Subfamily **Phylloxerinae** Dreyfus

This subfamily consists of two groups, the Chermisina and the Phylloxerina. Below is a key to these two groups taken from Van der Goot:

1. Body always with wax glands. Antennae of adults three-jointed, seemingly five-jointed, with three large sensoria. Gonapophyses appearing as three short lips. Sexuales dwarfed, with beak Group **Chermisina**
- Body usually without wax glands. Antennae of adults three-jointed, with two large sensoria. Gonapophyses seem to be lacking. Sexuales dwarfed, without beak Group **Phylloxerina**

Group **Chermisina** Börner

This group consists of three genera, *Pineus* Shimmer, *Cnapholodes* Macq., and *Chermes* Linn. as it is generally considered, although some authors add more, as *Gillettea* Del Guercio and *Guercioja* Mordw. In California but one of these genera is represented, and that by but two species.

46. Genus **Chermes** Linnaeus

Linnaeus, Syst. Nat., vol. 10, 1758. Type *Chermes sambuci* Linn.

178. **Chermes cooleyi** Gillette

Gillette, Proc. Acad. Nat. Sci. Phila., vol. 69, p. 3, 1907 (orig. desc.).
 Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909. *C. coweni* Gill. (list).
 Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910. *C. coweni* Gill. (list).
 Brannigan, Mon. Bull. Cal. Comm. Hort., vol. 4, p. 285, 1915 (list).

Records.—*Pseudotsuga taxifolia*, *Pinus pinea*; San Francisco Bay region, Sacramento Valley.

This species was first reported in California by Davidson, who found it on Douglas fir at Stanford University. Essig lists it from San Francisco, San Mateo, and Santa Clara counties on Douglas fir. In 1915 it was reported twice, once in Sacramento on Douglas fir, and once on Italian stone pine. The author has specimens from E. J. Vosler taken in Sacramento where it was found infesting the twigs and needles of Italian stone pine. Only the apterous females were present, however.

179. **Chermes pinicorticis** Fitch

Fitch, Trans. N. Y. State Agr. Soc., vol. 14, p. 971, 1855. *Coccus* (orig. desc.).

Stormont, 20th Ann. Rep. Illinois St. Ent., appendix, 1898 (desc.).

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909 (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910 (list).

Record.—*Pinus pinaster maritima*; Stanford University (Davidson).

This species, which is unknown to the author, was reported as present at Stanford University on *Pinus pinaster maritima*, where it was so abundant as to sometimes kill the young trees. For a complete description see Stormont's paper listed above.

Group **Phylloxerina** Börner

There are two genera in this tribe, as considered by Börner and Mordwilko, although the American authors have generally taken cognizance of but one, namely, *Phylloxera* Boyer. Below is a key from Mordwilko to these genera.

1. Neither wingless females nor any other forms secreting any waxy material. **Phylloxera** Boyer
- Wingless females secreting a waxy powder **Phylloxerina** Börner

47. Genus **Phylloxera** Boyer

Boyer de Fonscolombe, Ann. Ent. Soc. France, vol. 3, p. 222, 1834. Type *P. quercus* Boyer.

180. **Phylloxera vitifoliae** Fitch

Fitch, Rept. Ins. N. Y., vol. 1, p. 58, 1855 (orig. desc.).

Planchon, C.-R. Acad. Sci. Paris, vol. 67, pp. 588-594, 1868. *P. vastatrix* (desc.).

Clarke, Can. Ent., vol. 35, p. 248, 1903. *P. vastatrix* Plan (list).

Davidson, Jour. Econ. Ent., vol. 2, p. 299, 1909. *P. vastatrix* Plan. (list).

Davidson, Jour. Econ. Ent., vol. 3, p. 372, 1910. *P. vastatrix* Plan. (list).

Records.—Grape; Central and Northern California.

This is the only species of this genus reported in California. It is one of the most destructive species of plant lice in this section of the country, having in its time practically wiped out the grape industry of Santa Clara Valley, and of many other parts of the state. It seems that in California this species infests the roots only of the grape, the forms that produce the leaf galls in the eastern parts of the country not being found here.

48. Genus **Phylloxerina** Börner

Börner, Arbeiter aus d. kais. biol. Anst. f. Land- und Forstwirtschaft, vol. 6, pp. i-v, 81-320, 1908. Type *Phylloxera salicis* Linn.

This genus is represented in California by two species, one found on the stems of cottonwood (*Populus* sp.) and the other on the stems and exposed roots of willow (*Salix* sp.).

181. **Phylloxerina popularia** (Pergande)

Pergande, Proc. Davenport Acad. Sci., vol. 9, p. 266, 1904. *Phylloxera* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 8, p. 420, 1915. *Phylloxera* (list).

Records.—*Populus* spp.; Walnut Creek (Davidson), Merced (Beers).

The only report of this species in California is the one of Davidson who found it on *Populus fremonti* and *Populus trichocarpa* at Walnut Creek. On October 14, 1915, A. A. Beers of Merced sent some specimens to the author from balm of Gilead (*Populus balsamifera*) in Merced. These were all apterous females, and were found in great masses of white wax on the smaller branches and twigs. These reports are the only ones since its original report from Texas and Louisiana by Pergande.

182. **Phylloxerina salicola** (Pergande)

Pergande, Proc. Davenport Acad. Sci., vol. 9, p. 267, 1904. *Phylloxera* (orig. desc.).

Davidson, Jour. Econ. Ent., vol. 8, p. 419, 1915. *Phylloxera* (list).

Records.—*Salix* spp.; Walnut Creek (Davidson); Pasadena (Smith).

This species was also reported from Walnut Creek by Davidson on arroyo willow (*Salix lasiolepis*) where he found it on the stems and exposed roots. On October 13, 1915, A. G. Smith sent the author specimens from an ornamental willow (*Salix* sp.) in Pasadena, where he found it very abundantly that fall. The specimens were all apterous females, and were found in the midst of considerable masses of wax. This species has only been reported from Illinois, District of Columbia, and California.

APPENDIX 1

KEYS TO THE GENERA AND TRIBES OF APHIDIDAE

BY

P. VAN DER GOOT, 1913

Subfamily APHIDINAE

1. Antennae seven-jointed (better six-jointed). The last true joint with a distinct, more delicate continuation (terminal process). This continuation almost as long as, or even much longer than the last segment; if shorter, the cauda is distinctly wart-shaped, and the number of rudimentary gonapophyses is always two. Cornicles almost always well formed and clearly projecting. Wings with twice-branched cubitus, only once-branched in exceptional cases 2
- Antennae mostly six-jointed, the last joint with a short projection, this being usually distinctly shorter than half the last segment. Cornicles scarcely projecting, very often only appearing as pores or entirely absent. Wings with a simple or once-branched cubitus 5
2. Cauda wart-like, occasionally not so, or scarcely separated, but then the number of rudimentary gonapophyses is always distinctly two 3
- Cauda sickle-shaped or knobbed, not wart-like, only very seldom absent. Rudimentary gonapophyses always three **Siphonophorina**
3. Cornicles very long, almost cylindrical. Rudimentary gonapophyses three. **Drepanosiphina**
- Cornicles very short, somewhat clubbed. Rudimentary gonapophyses two or four 4
4. Number of rudimentary gonapophyses four. Body never with long clubbed hairs **Chaitophorina**
- Number of rudimentary gonapophyses two. Body often with knobbed hairs. Tarsi always with two pulvillae [Haftlappchen] **Callipterina**
5. Cauda wart-like 6
- Cauda not wart-like, usually absent 7
6. Anal plate bilobed. Sensoria of alate females linear **Hormaphidina**
- Anal plate simple. Sensoria of alate females circular **Vacunina** p.p.
7. Cauda distinctly sickle-shaped **Mindarina**
- Cauda only scarcely or not at all separated 8
8. Antennae five-jointed. Cornicles very short, only slightly projecting. Body without distinct wax gland groups **Vacunina** p.p.
- Antennae six-jointed, those of the apterous forms often only four- or five-jointed. Cornicles often only pores or entirely lacking. Body often with wax gland 9
9. Body with long, mostly fine hairs; without distinctly facettcd wax gland plates. Primary sensoria almost always without hairy edges 10
- Body naked; very often with distinctly facettcd wax-gland plates. Primary sensoria often with hairy edges 11
10. Rudimentary gonapophyses three. Wings mostly with twice-branched cubitus. Cornicles always prominent **Lachnina**
- Rudimentary gonapophyses none. Wings with simple or once-branched cubitus. Cornicles often absent **Anoeiina**

11. Rudimentary gonapophyses three. Facets of wax-gland plates almost equal-sized. Wings with simple cubitus. Sensoria of alate forms long oval, not linear **Pemphigina**
- Rudimentary gonapophyses none. Wax gland plates always with at least one large central facet. Sensoria of alate forms linear. Wings with simple or once-branched cubitus **Schizoneurina**

Subfamily CHERMISINAE

1. Rudimentary gonapophyses appearing as three short cones. Wax glands almost always present **Chermisina**
- Rudimentary gonapophyses seemingly lacking. Wax glands mostly absent. **Phylloxerina**

Group SIPHONOPHORINA

1. Apterous forms with a few sensoria on the third antennal segment. Antennal tubercles usually well formed. Body almost never with lateral tubercles, in any case these are never formed on the seventh abdominal segment 2
- Apterous forms without sensoria on the third antennal segment. Antennal tubercles often small or absent. Body with lateral tubercles 4
2. Cornicles almost cylindrical, or rarely somewhat swollen on the side, but then the body is covered with capitate hairs 3
- Cornicles distinctly clavate. Body almost bare, never with capitate hairs. **Rhopalosiphum** Koch

Type *Amphorophora ampullata* Buckton.

3. Body of apterous forms with long capitate hairs. First antennal joint drawn out, somewhat tooth-shaped on the inner side **Myzus** Passerini
- Type *Aphis ribis* Linn.

- Body of apterous forms bare or without capitate hairs. First antennal joint never drawn out, tooth-like **Macrosiphum** Passerini
- Type *Aphis millifolii* Fabr.

4. Body of apterous forms with capitate hairs. First antennal joint more or less toothed on inner side **Capitophorus** n.gn.
- Type *Phorodon carduium* Walker.

- Body of apterous forms without capitate hairs. First antennal joint not toothed 5

5. Body with many long delicate hairs. Cornicles short, somewhat swollen. **Cladobius** (Koch.) Pass.

Type *Aphis populea* Kalt.

- Body bare or almost so 6
6. Cornicles almost as long or longer than cauda 7
- Cornicles much shorter than cauda 16
7. Cornicles always distinctly clavate **Siphocoryne** Pass.

Type *Aphis avenae* Fabr.

- Cornicles cylindrical or conical 8
8. Antennal tubercles well formed, very distinctly toothed on the inner side. Tubercles on the side of the body always absent 9
- Antennal tubercles mostly small or lacking, never distinctly toothed. Body often with lateral tubercles 10

9. Antennal tubercles very strongly toothed, the first joint being distinctly toothed on the inner side **Phorodon** Pass.

Type *Aphis humuli* Schr.

- Antennal tubercles only slightly toothed, first antennal joint being rounded or flat on the inner side, never toothed **Ovatus** n.gn.

Type *Ovatus mespili* v. d. G.

10. Antennal tubercles well formed, strongly rounded on the inner side.
 Type *Aphis cerasi* Fabr. **Myzoides** n.gn.
 — Antennal tubercles small or lacking, never drawn out distinctly on inner side 11
11. Body with small tubercles on the middle of the seventh and eighth abdominal segments, and often also on the head and prothorax **Dentatus** n.gn.
 Type *Aphis sorbi* Kalt.
 — Body without tubercles on the middle of the seventh and eighth abdominal segments 12
12. Cubitus of fore wing only once-branched **Toxoptera** Koch
 Type *Toxoptera graminum* (Rond.).
 — Cubitus of fore wing always twice-branched. Body often with lateral tubercles 13
13. Cornicles short, always distinctly conical. Cauda very short, broad with rounded tip, usually approximately the length of the cornicles, or entirely lacking. Lateral tubercles lacking or only indistinctly formed on the anterior abdominal segments 15
 — Cornicles long, almost cylindrical. Cauda sickle- or club-shaped, usually distinctly shorter than cornicles 14
14. Body long without lateral tubercles. Front often with a very distinct tubercle in the middle **Myzaphis** n.gn.
 Type *Aphis rosarum* Walker.
 — Body more rounded, with lateral tubercles. Front usually flat, never with a distinct tubercle **Aphis** Linn.
 Type *Aphis rumicis* Linn.
15. Cauda distinctly separated, almost as long as broad **Brachycaudus** n.gn.
 Type *Aphis myosotidis* Koch.
 (*Aphis cardui* Linn. belongs in this genus.)
 — Cauda lacking or scarcely separated, much shorter than broad **Acaudus** n.gn.
 Type *Aphis lychnidis* Linn.
16. Cornicles distinctly longer than broad. Cauda usually not conical 17
 — Cornicles extremely short, scarcely projecting, cylindrical, usually nearly as long as broad. Cauda always conical with broad base 19
17. Cornicles only a little longer than broad, distinctly conical. Cauda sickle- or club-shaped **Longicaudis** n.gn.
 Type *Hyalopterus trirhodus* (Walker).
 — Cornicles cylindrical, at least twice as long as broad 18
18. Body with lateral tubercles on first and seventh abdominal segments. Cauda small, club-shaped **Hyalopterus** Koch
 Type *Aphis pruni* Fabr.
 — Body without lateral tubercles on first and seventh abdominal segments. Cauda conical **Semiaphis** n.gn.
 Type *Aphis carotae* Koch.
19. Body long, without lateral tubercles. Antennae short, at the most about half the length of the body **Brachycolus** Buckton
 Type *Brachycolus stellariae* (Hardy).
 — Body oval with lateral tubercles on prothorax, first and seventh abdominal segments. Antennae at least about three-fourths as long as the body.
 Type *Aphis thalictri* Koch. **Brachysiphum** n.gn.

Group DREPANOSIPHINA

Genus *Drepanosiphum* Koch. Type *Drepanosiphum platanoides* Schrank.

Group CALLIPTERINA

1. Antennae six-jointed. Cornicles merely pores. Body always with wax glands **Phyllaphis** Koch
 Type *Phyllaphis fagi* (Linn.).
- Antennae seven-jointed, the terminal process at least one-half as long as the preceding joint. Cornicles always distinctly projecting. Body almost always without wax glands, these always of similar shape 2
2. Seventh antennal joint distinctly longer than sixth 3
- Seventh antennal joint only as long as, or shorter than sixth 6
3. Cornicles but slightly projecting. Antennae curved as in beetles. **Bradyaphis** Mord.
 Type *Bradyaphis antennata* (Kalt.).
- Cornicles distinctly prominent. Antennae straight 4
4. Anal plate only slightly emarginate, never bilobed. Body with tolerably stiff hairs, these are never capitate. Apterous forms always with sensoria on third antennal joint **Callipterinella** n.gn.
 Type *Callipterus betularius* Kalt.
- Anal plate distinctly bilobed. Body bare or with capitate hairs 5
5. Apterous forms without sensoria on third antennal joint. The body always with capitate hairs **Callipterus** Koch
 Type *Callipterus coryli* (Goetze).
- Apterous forms with a few sensoria on third antennal joint. Body with distinct tubercles **Tuberculatus** Mord.
 Type *Tuberculatus betulicolus* (Kalt.).
6. Anal plate distinctly bilobed 8
- Anal plate always simple 7
7. Cauda wart-like, distinctly separated from base. Apterous forms without sensoria on third antennal joint **Callipteroides** Mord.
 Type *Callipterus betulae* Koch.
- Cauda scarcely visible. Sensoria present on third antennal joint of apterous forms **Symydobius** Mord.
 Type *Symydobius oblongus* (Heyden).
8. Seventh antennal joint nearly as long as the sixth. Wings with only very small black spots at the tip of the veins **Subcallipterus** Mord.
 Type *Callipterus alni* (Fabr.).
- Seventh antennal joint nearly half as long as sixth. Wings black spotted. **Pterocallis** Pass.
 Type *Pterocallis tiliae* (Linn.).

Group CHAITOPHORINA

1. Body with long delicate hairs. Antennae seven-jointed. Cornicles well developed 2
- Body with short thorn-like hairs. Antennae six-jointed, the terminal process always distinctly longer than the preceding joint. Cornicles only slightly projecting **Sipha** Passerini
 Type *Sipha glyceriae* (Kalt.).
2. Tarsi with two "Haftläppchen" [i.e., the empodial hair is spatula-like]. **Chaitophorinella** n.gn.
 Type *Chaitophorus testudinatus* (Thornton).
- Tarsi without "Haftläppchen" [i.e., the empodial hair is bristle-like]. **Chaitophorus** Koch
 Type *Chaitophorus leucomelas* Koch.

Group LACHNINA

1. Wings usually with twice-branched cubitus, the radius always straight. Cauda not at all or only slightly separated **Lachnus** Ill.
Type *Lachnus juniperi* De Geer.
- Wings with once- or twice-branched cubitus and with a curved radius; the membrane usually with dusky markings. Cauda usually slightly separated 2
2. Beak distinctly longer than the body, strongly retractile. Cubitus but once-branched, the wings only slightly darkened **Stomaphis** Buckton
Type *Stomaphis quercus* (Linn.).
- Beak clearly shorter than body and only slightly retractile. Wings beautifully spotted with dark brown 3
3. Cubitus twice-branched **Dryobius** Koch
Type *Dryobius croaticus* Koch.
- Cubitus once-branched **Schizodryobius** n.g.
Type *Lachnus exsicicator* Hart.

Tribe ANOECIINA

1. Hind tarsi elongate **Trama** Heyden
Type *Trama radialis* Koch.
- Hind tarsi not elongate 2
2. Cubitus once-branched. Cornicles present, quite prominent. Margin of body with peculiar non-faceted "wax-gland" (?) plates **Anoecia** Koch
Type *Anoecia corni* (Fabr.).
- Cubitus not branched. Cornicles absent. Wax gland plates not present. **Tullgrenia** v. d. G.
Type *Tullgrenia phaseoli* (Pass.).

Tribe HORMAPHIDINA

1. Antennae always five-segmented. The fronds almost without exception with two little horns. Cubitus once branched **Cerataphis** Licht.
Type *C. lataniae* Boisd.
- Antennae of the apterae often only three-segmented. Fronds without protuberances. Cubitus simple **Hamamelistes** Schim.
Type *H. betulae* Mordw.

APPENDIX 2

HOST PLANT LIST OF CALIFORNIA APHIDIDAE³⁵*Abies* (fir)

- 45. *Lachnus ferrisi* Swain
- 47. *Lachnus occidentalis* Dvdn.
- 176. *Mindarus abietinus* Koch

Abutilon (Indian mallow)

- 146. *Aphis senecio* Swain
- 104. *Rhopalosiphum persicae* (Sulz.)

Acer (maple, box elder)

- 5. *Drepanaphis acerifolii* (Thomas)
- 4. *Drepanosiphum platanoides* (Schrank)
- 33. *Thomasia negundinis* (Thomas)

Achillea (yarrow)

- 79. *Macrosiphum solanifolii* (Ashmead)

Aegopodium (goutweed)

- 108. *Siphocoryne capreae* (Fabr.)

Aesculus (California buckeye)

- 88. *Myzus circumflexus* (Buckton)
- 171. *Prociphilus venafuscus* Patch

Alder, see *Alnus*Alfalfa, see *Medicago*Alfilerilla, see *Erodium**Alisma* (water plantain)

- 156. *Siphocoryne nymphaeae* (Linn.)

Almond, see *Prunus**Alnus* (Alder)

- 9. *Eucallipterus flava* (Davidson)
- 8. *Euceraphis gillettei* Davidson
- 11. *Myzocallis alnifoliae* (Fitch)

Alopecurus (foxtail)

- 68. *Macrosiphum granarium* (Kirby)
- 88. *Myzus circumflexus* (Buckton)

Althaea (hollyhock)

- 121. *Aphis euonomi* Fabr.

Alum root, see *Heuchera*

³⁵ In the following list only the generic and common names of the plants are employed, the various species of plants being omitted. Although in certain cases aphids are restricted to certain species, as *Eriosoma lanuginosa* Hartig on *Pyrus communis* but not on *Pyrus malus*, these are in the minority. The botanical names are taken from the following works, with preference as in the order listed:

Bailey, L. H., Standard cyclopedia of horticulture, vols. 1-6, New York, Macmillan, 1914-1917.

Robinson, B. L., and Fernald, M. L., Gray's New manual of botany, ed. 7, Cambridge, Harvard University, 1908.

Jepson, W. L., A flora of western middle California, ed. 2, San Francisco, Cunningham, 1911.

Abrams, LeRoy, Flora of Los Angeles and vicinity, Palo Alto, Stanford University Press, 1904.

Amaranthus (pigweed)

- 123. *Aphis gossypii* Glover
- 132. *Aphis middletonii* Thomas
- 104. *Rhopalosiphum persicae* (Sulz.)
- 163. *Trifidaphis radicicola* (Essig)

Ambrosia (ragweed)

- 146. *Aphis senecio* Swain
- 77. *Macrosiphum rudbeckiae* (Fitch)

Ampelodesma

- 68. *Macrosiphum granarium* (Kirby)

Amsinckia (amsinckia)

- 146. *Aphis senecio* Swain
- 104. *Rhopalosiphum persicae* (Sulz.)

Angelica (angelica)

- 109. *Aphis angelicae* Koch
- 115. *Aphis cari* Essig
- 108. *Siphocoryne capreae* (Fabr.)

Anise, Wild, see *Carum**Anthemis* (chamomile)

- 121. *Aphis euonomi* Fabr.
- 146. *Aphis senecio* Swain
- 123. *Aphis gossypii* Glover

Apple, see *Pyrus*Apricot, see *Prunus**Aquilegia* (columbine)

- 85. *Myzus aquilegiae* Essig

Arbor vitae, see *Thuja* sp.*Arbutus* (madroña, strawberry tree)

- 103. *Rhopalosiphum nervatum* Gillette

Arctostaphylos (manzanita)

- 1. *Phyllaphis coweni* (Cockerell)
- 103. *Rhopalosiphum nervatum* Gillette

Artemisia (sagebrush, oldman, California mugwort, etc.)

- 122. *Aphis frigidae* Oestlund
- 131. *Aphis medicaginis* Koch
- 137. *Aphis oregonensis* Wilson
- 146. *Aphis senecio* Swain
- 61. *Macrosiphum artemisiae* (Fonse.)
- 62. *Macrosiphum artemisicola* (Williams)
- 72. *Macrosiphum ludoviciana* (Oestlund)

Artichoke, see *Cynara**Arundinaria* (bamboo)

- 12. *Myzocallis arundicolens* (Clarke)
- 13. *Myzocallis arundinariae* Essig

Arundo (giant reed)

- 12. *Myzocallis arundicolens* (Clarke)
- 13. *Myzocallis arundinariae* Essig

Asclepias (milkweed)

- 123. *Aphis gossypii* Glover
- 135. *Aphis nerii* Fonse.
- 102. *Rhopalosiphum lactucae* (Kalt.)

- Ash, see *Frazinus*
Arparagus (asparagus, smilax, asparagus fern)
 123. *Aphis gossypii* Glover
 88. *Myzus circumflexus* (Buckton)
Aster (aster)
 132. *Aphis middletonii* Thomas
 146. *Aphis senecio* Swain
Astragalus (loco weed)
 131. *Aphis medicaginis* Koch
Atriplex (orache)
 147. *Aphis tetrapteralis* Cockerell
 79. *Macrosiphum solanifolii* (Ashmead)
 Avocado, see *Persea*
Avena (oats)
 111. *Aphis avenae* Fabr.
 68. *Macrosiphum granarium* (Kirby)
 105. *Rhopalosiphum rhois* Monell
Baccharis (groundsel)
 146. *Aphis senecio* Swain
 63. *Macrosiphum baccharadis* (Clarke)
 77. *Macrosiphum ruddbeckiae* (Fitch)
 104. *Rhopalosiphum persicae* (Sulz.)
 Bamboo, see *Arundinaria*, *Bambusa*, and *Phyllostachys*
Bambusa (bamboo)
 12. *Myzocallis arundicolens* (Clarke)
 Banana, see *Musa*
 Barberry, see *Berberis*
 Barley, see *Hordeum*
 Basswood, see *Tilia*
 Bean, see *Phaseolus*
 Bean, Blackeye, see *Vigna*
 Bean, Broad, see *Vicia*
 Beech, see *Fagus*
 Beet, see *Beta*
Begonia (begonia)
 123. *Aphis gossypii* Glover
 Bell, fairy, see *Dipsorum*
Berberis (barberry)
 154. *Liosomaphis berberidis* (Kalt.)
Beta (beet, sugarbeet)
 124. *Aphis gossypii* Glover
 164. *Pemphigus betae* Doane
Betula (birch)
 6. *Calaphis betulaccolens* (Fitch)
 27. *Callipterinella annulata* (Koch)
 7. *Euceraphis betulae* (Koch)
 Birch, see *Betula*
 Blackberry, see *Rubus*
Bougainvillea (bougainvillea)
 104. *Rhopalosiphum persicae* (Sulz.)
 Boxelder, see *Acer*

Brassica (cabbage, mustard, turnip, etc.)

112. *Aphis brassicae* Linn.

144. *Aphis pseudobrassicae* Davis

166. *Pemphigus populi-transversus* Riley (?)

102. *Rhopalosiphum lactucae* (Kalt.)

104. *Rhopalosiphum persicae* (Sulz.)

Broom, see *Cytisus*

Buckeye, California, see *Aesculus*

Buckton, see *Rhamnus*

Bur clover, see *Medicago*

Buttercup, see *Ranunculus*

Cabbage, see *Brassica*

Calendula (marigold)

113. *Aphis calendulicola* Monell

121. *Aphis euonomi* Fabr.

146. *Aphis senecio* Swain

California buckeye, see *Aesculus*

California holly, see *Heteromeles*

California mugwort, see *Artemisia*

California poppy, see *Eschscholtzia*

California sagebrush, see *Artemisia*

California tule, see *Typha*

Calla, see *Zantedeschia*

Camellia (camellia)

152. *Toxoptera aurantii* (Fonse.)

Canary grass, see *Phalaris*

Cantaloupe, see *Cucumis*

Capsella (shepherd's purse)

112. *Aphis brassicae* Linn.

123. *Aphis gossypii* Glover

141. *Aphis pseudobrassicae* Davis

104. *Rhopalosiphum persicae* (Sulz.)

Capsicum (pepper pimento)

104. *Rhopalosiphum persicae* (Sulz.)

Caragana (pea tree)

131. *Aphis medicaginis* Koch.

Carum (wild anise)

115. *Aphis cari* Essig

155. *Siphocoryne capreae* (Fabr.)

Castanea (chestnut)

15. *Myzocallis castanicola* Baker (*dauidsoni* Swain)

Catalpa (catalpa)

123. *Aphis gossypii* Glover

139. *Aphis pomi* de Geer

104. *Rhopalosiphum persicae* (Sulz.)

Cauliflower, see *Brassica*

Ceanothus (mountain lilac)

116. *Aphis ceanothi* Clarke

Centaurea (tadalote)

130. *Aphis marutae* Oestlund

Centranthus (red valerian)

76. *Macrosiphum rosae* (Linn.)

104. *Rhopalosiphum persicae* (Sulz.)

Chacrophyllum

- 155.
- Siphocoryne capreae*
- (Fabr.)

Chamomile, see *Anthemis*Chaparral broom, see *Baccharis*Charlock, see *Brassica*Cheeseweed, see *Malva**Cheiranthus* (wallflower)

- 88.
- Myzus circumflexus*
- (Buckton)

Chenopodium (lamb's-quarters, pigweed)

- 110.
- Aphis atriplicis*
- Linn.

- 123.
- Aphis gossypii*
- Glover

- 124.
- Aphis hederæ*
- Kalt. (?)

- 164.
- Pemphigus betæ*
- Doane (?)

- 104.
- Rhopalosiphum persicæ*
- (Sulz.)

Cherry, see *Prunus*Cherry, wild, see *Prunus*Chestnut, see *Castanea*Chestnut, Horse, see *Aesculus*Chicory, see *Chicorium*Christmas berry, see *Heteromeles**Chrysanthemum* (chrysanthemum)

- 56.
- Amphorophora latysiphon*
- Davidson

- 123.
- Aphis gossypii*
- Glover

- 146.
- Aphis senecio*
- Swain

- 160.
- Coloradoa rufomaculata*
- Wilson

- 77.
- Macrosiphum rudbeckiæ*
- (Fitch)

- 78.
- Macrosiphum sanborni*
- Gillette

Cichorium (chicory)

- 71.
- Macrosiphum lactucæ*
- (Kalt.)

Cicuta (water hemlock)

- 155.
- Siphocoryne capreae*
- (Fabr.)

Cirsium (thistle)

- 144.
- Aphis cardui*
- Linn.

Citrullus (watermelon)

- 123.
- Aphis gossypii*
- Glover

Citrus (citrus, orange, lemon, etc.)

- 118.
- Aphis cooki*
- Essig

- 123.
- Aphis gossypii*
- Glover

- 131.
- Aphis medicaginis*
- Koch

- 79.
- Macrosiphum solanifolii*
- (Ashmead)

- 104.
- Rhopalosiphum persicæ*
- (Sulz.)

- 152.
- Toxoptera aurantii*
- (Fonsc.)

Clarkia (clarkia)

- 104.
- Rhopalosiphum persicæ*
- (Sulz.)

Clematis (clematis)

- 94.
- Myzus varians*
- Davidson

Clover, see *Trifolium*Clover, Sweet, see *Melilotus*Coffeeberry, see *Rhamnus*Columbine, see *Aquilegia**Compositæ* (various species)

- 131.
- Aphis medicaginis*
- Koch

- 65.
- Macrosiphum chrysanthemi*
- (Oestlund)

- 77.
- Macrosiphum rudbeckiæ*
- (Fitch)

- Conium* (poison hemlock)
 159. *Siphocoryne pastinacae* (Linn.)
- Convolvulus* (morning glory)
 56. *Amphorophora latysiphon* Davidson
 123. *Aphis gossypii* Glover
 72. *Macrosiphum ludoviciana* (Oestlund)
- Corn, see *Zea*
- Cornus* (dogwood)
 119. *Aphis cornifoliae* Fitch
 123. *Aphis gossypii* Glover
- Corylus* (hazelnut)
 16. *Myzocallis coryli* (Goetze)
 100. *Rhopalosiphum corylinum* Davidson
- Cotoneaster* (cotoneaster)
 139. *Aphis pomi* de Geer
- Cotton, see *Gossypium*
- Cottonwood, see *Populus*
- Cow parsnip, see *Heracleum*
- Cowpea, see *Vigna*
- Cowslip, see *Primula*
- Crab apple, see *Pyrus*
- Cranesbill, see *Geranium*
- Crataegus* (hawthorn)
 120. *Aphis crataegifoliae* Fitch
 139. *Aphis pomi* de Geer
- Cruciferae* (various spp.)
 112. *Aphis brassicae* Linn.
 141. *Aphis pseudobrassicae* Davis
- Cucumber, see *Cucumis*
- Cucumis* (cucumber, muskmelon, cantaloupe, etc.)
 123. *Aphis gossypii* Glover
- Cucurbita* (squash, gourd, pumpkin, etc.)
 123. *Aphis gossypii* Glover
 66. *Macrosiphum cucurbitae* (Thomas)
- Cupressus* (cypress)
 161. *Cerosipha cupressi* Swain
 96. *Macrosiphum morrisoni* Swain
- Currant, see *Ribes*
- Cydonia* (quince)
 139. *Aphis pomi* De Geer
- Cynara* (artichoke)
 86. *Myzus braggii* Gillette
- Cynoglossum* (houndstongue)
 104. *Rhopalosiphum persicae* (Sulz.)
- Cypress, see *Cupressus*
- Cyrtomium* (holly fern)
 162. *Cerataphis lataniae* (Boisd.)
 58. *Idiopterus nephrolepidis* Davis
 88. *Myzus circumflexus* (Buckton)
- Cytisus* (broom)
 146. *Aphis senecio* Swain
 104. *Rhopalosiphum persicae* (Sulz.)

- Dandelion, see *Taraxacum*
Datura (jimson weed)
 123. *Aphis gossypii* Glover
Deinandra
 79. *Macrosiphum solanifolii* (Ashmead)
Digitalis (foxglove)
 88. *Myzus circumflexus* (Buckton)
Dipsacus (fuller's teasel)
 76. *Macrosiphum rosae* (Linn.)
 77. *Macrosiphum rudbeckiae* (Fitch)
 104. *Rhopalosiphum persicae* (Sulz.)
Disporum (fairy bell)
 79. *Macrosiphum solanifolii* (Ashmead)
 Dock, see *Rumex*
 Dogwood, see *Cornus*
 Douglas fir, see *Pseudotsuga*
Dracaena (dragon tree)
 111. *Aphis avenae* Fabr.
 Dragon tree, see *Dracaena*
 Elderberry, see *Sambucus*
 Elm, see *Ulmus*
Elymus (wild rye)
 68. *Macrosiphum granarium* (Kirby)
 English ivy, see *Hedera*
Epilobium (fireweed)
 136. *Aphis oenotherae* Oestlund
Eriobotrya (loquat)
 139. *Aphis pomi* de Geer
Erodium (alfilerilla)
 79. *Macrosiphum solanifolii* (Ashmead)
 104. *Rhopalosiphum persicae* (Sulz.)
Erysimum (western wallflower)
 155. *Siphocoryne capreae* (Fabr.)
Escallonia (escallonia)
 104. *Rhopalosiphum persicae* (Sulz.)
Eschscholtzia (California poppy)
 123. *Aphis gossypii* Glover
 Everlasting, see *Gnaphalium*
Fagus (beech)
 2. *Phyllaphis fagi* (Linn.)
 Fairybell, see *Dipsorum*
 Fennel, see *Foeniculum*
 Fenugreek, see *Trigonella*
 Fern, asparagus, see *Asparagus*
 Fern, Boston, see *Nephrolepis*
 Fern, holly, see *Cyrtomium*
 Fig marigold, see *Mesembryanthemum*
 Figwort, see *Scrophularia*
 Fir, see *Abies*
 Fir, Douglas, see *Pseudotsuga*
 Fireweed, see *Epilobium*
Foeniculum (fennel)
 155. *Siphocoryne capreae* (Fabr.)

- Foxglove, see *Digitalis*
Foxtail, see *Alopecurus*
Fragaria (strawberry)
 90. *Myzus fragaefolii* Cockerell
Fraxinus (ash)
 171. *Prociphilus venafuscus* Patch
 167. *Thecabius californicus* (Davidson)
Fuller's teasel, see *Dipsacus*
Fuchsia (fuchsia)
 79. *Macrosiphum solanifolii* (Ashmead)
 88. *Myzus circumflexus* (Buckton)
Gambleweed, see *Sanicula*
Geranium, see *Pelargonium*
Geranium (cranesbill)
 104. *Rhopalosiphum persicae* (Sulz.)
German ivy, see *Senecio*
Gladiolus (gladiolus)
 88. *Myzus circumflexus* (Buckton)
Glycyrrhiza (liquorice)
 131. *Aphis medicaginis* Koch
Gnaphalium (everlasting)
 146. *Aphis senecio* Swain
 60. *Macrosiphum ambrosiae* (Thomas)
Gooseberry, see *Ribes*
Goosefoot, see *Chenopodium*
Gossypium (cotton)
 123. *Aphis gossypii* Glover
Gourd, see *Cucurbita*
Goutweed, see *Aegopodium*
Graminaceae (various species)
 111. *Aphis avenae* Fabr.
 67. *Macrosiphum dirhodum* (Walker)
 68. *Macrosiphum granarium* (Kirby)
 105. *Rhopalosiphum rhois* Monell
Grape, see *Vitis*
Grindelia (marsh grindelia)
 146. *Aphis senecio* Swain
Hawthorn, see *Crataegus*
Hazelnut, see *Corylus*
Hedera (English ivy)
 109. *Aphis angelicae* Koch
 124. *Aphis hederæ* Kalt
 104. *Rhopalosiphum persicae* (Sulz.)
Hedge mustard, see *Sisymbrium*
Hedge nettle, see *Stachys*
Helianthus (sunflower)
 123. *Aphis gossypii* Glover
 132. *Aphis middletonii* Thomas
 146. *Aphis senecio* Swain
 60. *Macrosiphum ambrosiae* (Thomas)
 77. *Macrosiphum rudbeckiae* (Fitch)
 104. *Rhopalosiphum persicae* (Sulz.)

- Hemlock, Poison, see *Conium*
 Hemlock, Water, see *Cicuta*
Heracleum (cow parsnip)
 123. *Aphis gossypii* Glover
 125. *Aphis heraclei* Cowen
Heteromeles (California holly, Christmas berry)
 170. *Prociphilus alnifoliae* (Williams)
 103. *Rhopalosiphum nervatum* Gillette
Heuchera (alum root)
 69. *Macrosiphum heucherae* (Thomas)
Hibiscus (rose mallow)
 121. *Aphis euonomi* Fabr.
 Holly fern, see *Cyrtonium*
 Hollyhock, see *Althaea*
 Holly, mountain, see *Heteromeles*
 Honey flower, see *Melianthus*
 Honeysuckle, see *Lonicera*
 Hop, see *Humulus*
Hordeum (barley)
 111. *Aphis avenae* Fabr.
 68. *Macrosiphum granarium* (Kirby)
 Houndstongue, see *Cynoglossum*
Humulus (hop)
 123. *Aphis gossypii* Glover
 98. *Phorodon humuli* (Schrank)
Hydrangea (hydrangea)
 123. *Aphis gossypii* Glover
 Indian mallow, see *Abutilon*
 Ironweed, see *Veronina*
 Ivy, English, see *Hedera*
 Ivy, German, see *Senecio*
Jasminum (jessamine)
 70. *Macrosiphum jasmini* (Clarke)
 Jessamine, see *Jasminum*
 Jimpson weed, see *Datura*
Juglans (walnut)
 24. *Callipterus californicus* (Essig)
 25. *Callipterus caryae* Monell
 23. *Chromaphis juglandicola* (Kalt.)
 26. *Monellia caryella* (Fitch)
 Knotweed, see *Polygonum*
Lactuca (lettuce)
 79. *Macrosiphum solanifolii* (Ashmead)
 Lamb's-quarters, see *Chenopodium*
Lathyrus (sweet pea)
 74. *Macrosiphum pisi* (Kalt.)
 Laurel, see *Laurus*
 Laurel, California, see *Umbellularia*
 Laurestinus, see *Viburnum*
Laurus (laurel)
 150. *Aphis viburnicolens* n.sp.

- Lavatera* (tree mallow)
 104. *Rhopalosiphum persicae* (Sulz.)
 Leather root, see *Psorales*
 Lemon, see *Citrus*
Lepidium (peppergrass)
 123. *Aphis gossypii* Glover
 Lettuce, see *Lactuca*
Ligusticum (lovage)
 155. *Siphocoryne capreae* (Fabr.)
 Lilac, see *Syringa*
 Lilac, Mountain, see *Ceanothus*
Lilium (lily)
 123. *Aphis gossypii* Glover
 88. *Myzus circumflexus* (Buckton)
 Lily, see *Lilium*
 Lily, Water, see *Nymphaea*
 Linden, see *Tilia*
 Liquorice, see *Glycyrrhiza*
Liriodendron (tulip tree)
 104. *Rhopalosiphum persicae* (Sulz.)
Lithospermum
 127. *Aphis lithospermi* Wilson
 Loco weed, see *Astragalus*
 Locust, see *Robinia*
 Loganberry, see *Rubus*
Lonicera (honeysuckle)
 157. *Siphocoryne pastinacae* (Linn.)
 Loquat, see *Eriobotrya*
 Lovage, see *Ligusticum*
Lupinus (lupine)
 59. *Macrosiphum albifrons* Essig
Lycopersicum (tomato)
 91. *Myzus lycopersicae* (Clarke)
 104. *Rhopalosiphum persicae* (Sulz.)
Madia (tarweed)
 77a. *Macrosiphum rudbeckiae* (Fitch) var. *madia* n.var.
 Madron, see *Arbutus*
 Mallow, Indian, see *Abutilon*
 Mallow, Rose, see *Hibiscus*
 Mallow tree, see *Lavatera*
Malva (cheeseweed)
 121. *Aphis euonomi* Fabr.
 123. *Aphis gossypii* Glover
 104. *Rhopalosiphum persicae* (Sulz.)
 Manzanita, see *Arctostaphylos*
 Maple, see *Acer*
 Marigold, see *Calendula*
 Marigold, fig, see *Mesembryanthemum*
Matthiola (ten-weeks' stock)
 141. *Aphis pseudobrassicae* Davis
 Mayten, see *Maytenus*
Maytenus (mayten)
 121. *Aphis euonomi* Fabr.

- Medicago* (alfalfa, bur clover, etc.)
 131. *Aphis medicaginis* Koch
 74. *Macrosiphum pisi* (Kalt.)
Melianthus (honey flower)
 104. *Rhopalosiphum persicae* (Sulz.)
Melilotus (sweet clover)
 131. *Aphis medicaginis* Koch
Mesembryanthemum (fig marigold)
 121. *Aphis euonomi* Fabr.
 Milk thistle, see *Silybum*
 Milkweed, see *Asclepias*
 Morning glory, see *Convolvulus*
Morus (mulberry)
 133. *Aphis mori* Clarke
 Mountain holly, see *Heteromeles*
 Mountain lilac, see *Ceanothus*
 Mugwort, California, see *Artemisia*
 Mulberry, see *Morus*
Musa (banana)
 111. *Aphis avenae* Fabr.
 Muskmelon, see *Cucumis*
 Mustard, see *Brassica*
 Mustard, Hedge, see *Sisymbrium*
 Mustard, Teasel, see *Erysimum*
 Nasturtium, see *Tropaeolum*
 Nectarine, see *Prunus*
Nephrolepis (Boston fern)
 58. *Idiopterus nephrolepidis* Davis
Nerium (oleander)
 135. *Aphis nerii* Fonsc.
 Nettle, Hedge, see *Stachys*
 Nettle, Stinging, see *Urtica*
 Nightshade, see *Solanum*
 Ninebark, see *Physocarpus*
Nymphaea (water lily)
 123. *Aphis gossypii* Glover
 156. *Siphocoryne nymphaeae* (Linn.)
 Oak, see *Quercus*
 Oak, Poison, see *Rhus*
 Oak, Tanbark, see *Pasania*
 Oats, see *Avena*
Oenothera (evening primrose)
 136. *Aphis oenotherae* Oestlund
 Oldman, see *Artemisia*
 Oleander, see *Nerium*
 Orange, see *Citrus*
 Orache, see *Atriplex*
Orchidaceae (orchids)
 162. *Cerataphis lataniae* (Boisd.)
Orthocarpus (owl clover)
 73. *Macrosiphum orthocarpi* Davidson
 Owl clover, see *Orthocarpus*

Oxalis (oxalis)97. *Macrosiphum solanifolii* (Ashmead)104. *Rhopalosiphum persicae* (Sulz.)152. *Toxoptera aurantii* (Fonse.)Pansy, see *Viola**Papaver* (poppy)121. *Aphis euonomi* Fabr. (*papaveris* Fabr.?)Parsley, see *Petroselinum*Parsnip, see *Pastinaca*Parsnip, Cow, see *Heracleum**Pasania* (tanbark oak)20. *Myzocallis pasaniae* Davidson*Pastinaca* (parsnip)156. *Siphocoryne pastinacae* (Linn.)Pea, see *Pisum*Pea, Cow, see *Vigna*Pea, Sweet, see *Lathyrus*Pea tree, see *Caragana*Peach, see *Prunus*Pear, see *Pyrus**Pelargonium* (geranium)97. *Pentalonia nigronervosa* Coquillett104. *Rhopalosiphum persicae* (Sulz.)*Pentstemon* (pentstemon)88. *Myzus circumflexus* (Buckton)104. *Rhopalosiphum persicae* (Sulz.)Pepper, see *Capsicum*Peppergrass, see *Lepidium*Periwinkle, see *Vinca**Persea* (avacado)123. *Aphis gossypii* Glover*Petroselinum* (parsley)155. *Siphocoryne capreae* (Fabr.)*Phalaris* (canary grass)111. *Aphis avenae* Fabr.153. *Hyalopterus arundinis* (Fabr.)*Phaseolus* (bean)121. *Aphis euonomi* Fabr. (*rumicis* Linn.?)131. *Aphis medicaginis* Koch74. *Macrosiphum pisi* (Kalt.)*Phragmites* (reed grass)153. *Hyalopterus arundinis* (Fabr.)*Phyllostachys* (bamboo)12. *Myzocallis arundicolens* (Clarke)*Physocarpus* (ninebark)100. *Rhopalosiphum corylinum* Davidson*Picea* (spruce)46. *Lachnus glehnus* Essig55. *Lachnus vanduzeei* n.sp.158. *Myzaphis abietina* (Walker)Pigweed, see *Amaranthus*, and *Chenopodium*Pimento, see *Capsicum*

Pimpinella

- 155.
- Siphocoryne capreae*
- (Fabr.)

Pine, see *Pinus**Pinus* (pine)

178. *Chermes cooleyi* Gillette
 179. *Chermes pinicorticis* Fitch
 43. *Essigella californica* (Essig)
 45. *Lachnus ferrisi* Swain
 48. *Lachnus oregonensis* Wilson
 49. *Lachnus pini-radiatae* Davidson
 50. *Lachnus ponderosa* Williams
 52. *Lachnus sabinianus* n.sp.
 53a. *Lachnus tomentosa* (De Geer) (Addenda)
 176. *Mindarus abietinus* Koch

Pisum (pea)

- 74.
- Macrosiphum pisi*
- (Kalt.)

Pittosporum (pittosporum)

139. *Aphis pomi* De Geer
 79. *Macrosiphum solanifolii* (Ashmead)
 104. *Rhopalosiphum persicae* (Sulz.)

Plantago (plantain)

123. *Aphis gossypii* Glover
 129. *Aphis malifoliae* Fitch (?)
 88. *Myzus circumflexus* (Buckton)

Plantain, see *Plantago*Plantain, Water, see *Alisma**Platanus* (western sycamore)

- 4.
- Drepanosiphum platanoides*
- (Schrank)

Plum, see *Prunus**Polygonum* (knotweed)

100. *Rhopalosiphum hippophaes* (Koch).
 156. *Siphocoryne nymphaeae* (Linn.)

Pomegranate, see *Punica*Pondweed, see *Potamogeton*Poplar, see *Populus*Poppy, see *Papaver*Poppy, California, see *Eschscholtzia**Populus* (poplar, cottonwood)

28. *Arctaphis populifolii* (Essig)
 164. *Pemphigus betae* Doane
 165. *Pemphigus populi-caulis* Fitch
 166. *Pemphigus populi-transversus* Riley
 181. *Phylloxera popularia* (Pergande)
 40. *Pterocomma populifoliae* (Fitch)
 167. *Thecabius californicus* (Davidson)
 168. *Thecabius populiconduplifolius* (Cowen)
 169. *Thecabius populi-monilis* (Riley)
 34. *Thomasia populicola* (Thomas)
 35. *Thomasia salicola* (Essig)

Potamogeton (pondweed)

- 156.
- Siphocoryne nymphaeae*
- (Linn.)

Potato, see *Solanum*

Primrose, Evening, see *Oenothera*

Primula (cowslip)

56. *Amphorophora latysiphon* Davidson

Prune, see *Prunus*

Prunus (almond, apricot, cherry, nectarine, peach, plum, prune)

107. *Aphis alamedensis* Clarke

114. *Aphis cardui* Linn.

117. *Aphis cerasifoliae* Fitch

138. *Aphis persicae-niger* Smith

140. *Aphis prunorum* Dobr.

153. *Hyalopterus arundinis* (Fabr.

87. *Myzus cerasi* (Fabr.)

98. *Phorodon humuli* (Schränk)

104. *Rhopalosiphum persicae* (Sulz.)

156. *Siphocoryne nymphaeae* (Linn.)

Pseudotsuga (Douglas fir)

178. *Chermes cooleyi* Gillette

43. *Essigella californica* (Essig)

51. *Lachnus pseudotsuga* Wilson

53. *Lachnus taxifolia* Swain

171. *Prociphilus venafuscus* Patch

Psorales (leather root)

74. *Macrosiphum pisi* (Kalt.)

Pteris (brake)

75. *Macrosiphum pteridis* Wilson

Punica (pomegranate)

123. *Aphis gossypii* Glover

Pumpkin, see *Cucurbita*

Pyrus (apple, pear)

123. *Aphis gossypii* Glover

129. *Aphis malifoliae* Fitch

139. *Aphis pomi* De Geer

175. *Eriosoma languinosa* Hartig (*pyricola* B. & D.)

174. *Eriosoma lanigerum* (Hausman)

Quercus (oak)

5. *Drepanaphis acerifoliae* (Fitch) (?)

14. *Myzocallis bellus* (Walsh)

15. *Myzocallis castanicola* Baker (*davidsoni* Swain)

17. *Myzocallis discolor* (Monell)

18. *Myzocallis punctatus* (Monell)

19. *Myzocallis californicus* Baker (*maureri* Swain)

21. *Myzocallis quercus* (Kalt.)

3. *Phyllaphis quercicola* Baker

36. *Symydobius agrifoliae* Essig

37. *Symydobius chrysolepis* Swain

177. *Vacuna dryophila* Schrank (?)

Quince, see *Cydonia*

Radish, see *Raphanus*

Ragweed, see *Ambrosia*

Ramona (black sage)

142. *Aphis ramona* Swain

- Ranunculus* (buttercup)
 132. *Aphis middletonii* Thomas
 104. *Rhopalosiphum persicae* (Sulz.)
 167. *Thecabius californicus* (Davidson)
 168. *Thecabius populiconduplifolius* (Cowen)
- Raphanus* (radish)
 112. *Aphis brassicae* Linn.
 141. *Aphis pseudobrassicae* Davis
 104. *Rhopalosiphum persicae* (Sulz.)
- Reed, Giant, see *Arundo*
 Reed grass, see *Phragmites*
- Rhamnus* (buckthorn, coffeeberry)
 123. *Aphis gossypii* Glover
 92. *Myzus rhamnus* (Clarke)
- Rhus* (poison oak)
 105. *Rhopalosiphum rhois* Monell
- Ribes* (currant, gooseberry)
 126. *Aphis houghtonensis* Troop
 134. *Aphis neo-mexicana* Ckll. var. *pacifica* Dvdn.
 89. *Myzus cynosbati* (Oestlund)
 93. *Myzus ribifolii* Davidson
- Robinia* (locust)
 131. *Aphis medicaginis* Koch
- Rosa* (rose, wild and cultivated)
 67. *Macrosiphum dirhodum* (Walker)
 76. *Macrosiphum rosae* (Linn.)
 159. *Myzaphis rosarum* (Walker)
 103. *Myzus nervatum* Gillette
- Rose, see *Rosa*
 Rose mallow, see *Hibiscus*
- Rubus* (blackberry, loganberry, thimbleberry)
 143. *Aphis rubiphila* Patch
 57. *Amphorophora rubi* (Kalt.)
 95. *Nectarosiphon rubicola* (Oestlund)
- Rumex* (dock, sorrell)
 121. *Aphis euonomi* Fabr. (*rumicis* Linn.)
 123. *Aphis gossypii* Glover
 146. *Aphis senecio* Swain
 164. *Pemphigus betae* Doane (?)
 104. *Rhopalosiphum persicae* (Sulz.)
- Rye, Wild, see *Elymus*
 Sagebrush, see *Artemisia*
 Sage, Black, see *Ramona*
- Salix* (willow)
 144. *Aphis salicicola* Thomas
 146. *Aphis senecio* Swain
 29. *Arctaphis viminalis* (Monell)
 31. *Fullawaya saliciradicis* Essig
 64. *Macrosiphum californicum* (Clarke)
 30. *Micrella monella* Essig
 182. *Phylloxera salicola* (Pergande)
 40. *Pterocomma flocculosa* (Weed)

- 41. *Pterocomma populifoliae* (Fitch)
- 42. *Pterocomma smithiae* (Monell)
- 155. *Siphocoryne capreae* (Fabr.)
- 38. *Symydobius macrostachyae* Essig
- 39. *Symydobius salicicorticis* Essig
- 32. *Thomasia crucis* Essig
- 34. *Thomasia populicola* (Thomas)
- 35. *Thomasia salicola* (Essig)
- 44. *Tuberolachnus viminalis* (Fonse.)
- Sambucus* (elderberry)
 - 145. *Aphis sambucifoliae* Fitch
 - 81. *Macrosiphum stanleyi* Wilson
 - 104. *Rhopalosiphum persicae* (Sulz.)
- Sanicula* (gambleweed)
 - 119. *Aphis cornifoliae* Fitch
 - 104. *Rhopalosiphum persicae* (Sulz.)
- Scrophularia* (figwort)
 - 99. *Phorodon scrophulariae* Thamos
- Senecio* (German ivy, ivy senecio)
 - 144. *Aphis senecio* Swain
 - 88. *Myzus circumflexus* (Buckton)
 - 104. *Rhopalosiphum persicae* (Sulz.)
- Shepherd's-purse, see *Capsella*
- Silybum* (milk thistle)
 - 121. *Aphis euonomi* Fabr.
 - 130. *Aphis marutae* Oestlund
- Sisymbrium* (hedge mustard)
 - 88. *Myzus circumflexus* (Buckton)
- Smilax, see *Asparagus*
- Snowball, see *Viburnum*
- Snowberry, see *Symphoricarpos*
- Solanum* (potato, nightshade)
 - 56. *Amphorophora latysiphon* Davidson
 - 79. *Macrosiphum solanifolii* (Ashmead)
 - 88. *Myzus circumflexus* (Buckton)
 - 102. *Rhopalosiphum lactucae* (Kalt.)
 - 104. *Rhopalosiphum persicae* (Sulz.)
 - 163. *Trifidaphis radicolica* (Essig)
- Sonchus* (sow thistle)
 - 79. *Macrosiphum solanifolii* (Ashmead)
 - 80. *Macrosiphum sonchella* (Monell)
 - 102. *Rhopalosiphum lactucae* (Kalt.)
 - 104. *Rhopalosiphum persicae* (Sulz.)
- Sorghum*
 - 129. *Aphis maidis* Fitch
- Sorrell, see *Rumex*
- Sow thistle see *Sonchus*
- Spinacia* (spinach)
 - 123. *Aphis gossypii* Glover
 - 104. *Rhopalosiphum persicae* (Sulz.)
- Spiraea* (spirea)
 - 148. *Aphis spiraeicola* Patch

- Spruce, see *Picea*
 Squash, see *Cucurbita*
Stachys (hedge nettle)
 73. *Macrosiphum ludoviciana* (Oestlund)
 88. *Myzus circumflexus* (Buckton)
 Stock, Ten-week, see *Matthiola*
 Strawberry, see *Fragaria*
 Strawberry tree, see *Arbutus*
 Sugar beet, see *Beta*
 Sunflower, see *Helianthus*
 Sweet clover, see *Melilotus*
 Sweet pea, see *Lathyrus*
 Sycamore, Western, see *Platanus*
Symphoricarpos (snowberry)
 108. *Aphis albipes* Oestlund
Syringa (lilac)
 131. *Aphis medicaginis* Koch
 Tacalote, see *Centaurea*
Taraxacum (dandelion)
 82. *Macrosiphum taraxici* (Kalt.)
 Tarweed, see *Madia* and *Hemizonia*
 Teasel, Fuller's, see *Dipsacus*
 Teasel, mustard, see *Erysimum*
 Thimbleberry, see *Rubus*
 Thistle, see *Cirsium*
 Thistle, Milk, see *Silybum*
 Thistle, Sow, see *Sonchus*
Thuja (arbor vitae)
 54. *Lachnus tujafilinus* (Del Guercio)
Tilia (linden, basswood)
 10. *Eucallipterus tiliae* (Linn.)
 Tomato, see *Lycopersicum*
Trifolium (clover)
 146a. *Aphis bakeri* Cowen
 131. *Aphis medicaginis* Koch
Trigonella (fenugreek)
 69. *Macrosiphum pisi* (Kalt.)
Triticum (wheat)
 111. *Aphis avenae* Fabr.
 64. *Macrosiphum granarium* (Kirby)
Tropaeolum (nasturtium)
 121. *Aphis euonomi* Fabr.
 88. *Myzus circumflexus* (Buckton)
 104. *Rhopalosiphum persicae* (Sulz.)
 Tule, California, see *Typha*
 Tulip, see *Tulipa*
 Tulip tree, see *Liriodendron*
Tulipa (tulip)
 83. *Macrosiphum tulipae* (Monell)
 104. *Rhopalosiphum persicae* (Sulz.)
 Turnip, see *Brassica*

Typha (California tule)

- 111. *Aphis avenae* Fabr.
- 153. *Hyalopterus arundinis* (Fabr.)
- 68. *Macrosiphum granarium* (Kirby)
- 156. *Siphocoryne nymphaeae* (Linn.)

Ulmus (elm)

- 28. *Arctaphis populifolii* (Essig) (?)
- 172. *Colopha ulmicola* (Fitch)
- 173. *Eriosoma americana* (Riley)
- 175. *Eriosoma lanuginosa* Hartig (*pyricola* B. & D.)
- 174. *Eriosoma lanigerum* (Hausman)
- 79. *Macrosiphum solanifolii* (Ashmead)
- 22. *Myzocallis ulmifolii* (Monell)

Umbellularia (California laurel)

- 88. *Myzus circumflexus* (Buckton)
- 104. *Rhopalosiphum persicae* (Sulz.)
- 157. *Siphocoryne pastinacae* (Linn.)

Urtica (stinging nettle)

- 121. *Aphis euonomi* Fabr.

Valerian, Red, see *Centranthus**Valeriana*

- 84. *Macrosiphum valerianae* (Clarke)

Vernonia (ironweed)

- 123. *Aphis gossypii* Glover

Vetch, see *Vicia**Viburnum* (lauristinus, snowball)

- 121. *Aphis euonomi* Fabr.
- 139. *Aphis pomi* De Geer
- 150. *Aphis viburnicolens* n.sp.

Vicia (horse bean, vetch)

- 121. *Aphis euonomi* Fabr. (*fabae* Scop.)
- 131. *Aphis medicaginis* Koch
- 74. *Macrosiphum pisi* (Kalt.)

Vigna (blackeye bean, cowpea)

- 131. *Aphis medicaginis* Koch

Vineca (periwinkle)

- 56. *Amphorophora latysiphon* Davidson
- 88. *Myzus circumflexus* (Buckton)
- 104. *Rhopalosiphum persicae* (Sulz.)

Viola (pansy, violet)

- 58. *Idiopterus nephrolepidis* Davis
- 74. *Macrosiphum pisi* (Kalt.)
- 88. *Myzus circumflexus* (Buckton)
- 106. *Rhopalosiphum violae* Pergande

Vitis (grape)

- 180. *Phylloxera vitifoliae* (Fitch)

Wallflower, see *Cheiranthus*Wallflower, Western, see *Erysimum*Walnut, see *Juglans*Water hemlock, see *Cicuta*Watermelon, see *Citrullus*Water plantain, see *Alisma*

Wheat, see *Triticum*

Willow, see *Salix*

Yarrow, see *Achillea*

Yucca (yucca)

151. *Aphis yuccae* Cowen

Zantedeschia (calla)

88. *Myzus circumflexus* (Buckton)

Zea (corn)

111. *Aphis avenae* Fabr.

128. *Aphis maidis* Fitch

Zizia

155. *Siphocoryne capreae* (Fabr.)

ADDENDA

Since the preparation of this manuscript there have appeared a few papers³⁶ in which there are some new records for certain of the California Aphididae and in which there are notes concerning the synonymy of some of the species. These records are noted here and are listed in the Host Plant Index (appendix 2).

2. *Phyllaphis fagi* (Linn.) on *Fagus tricolor*, Oakland (Essig, p. 321).

7. *Euceraphis betulae* (Koch) on *Betula populifolia laciniata* and *B. papyrifera* (Essig, pp. 322-323).

10. *Eucallipterus tiliae* (Linn.) on *Tilia tomentosa*, Berkeley (Essig, p. 323). Baker places this species in the genus *Myzocallis*, for although it is quite distinct from the type of *Myzocallis*, various species form definite connections leading to this one.

15. *Myzocallis castanicola* Baker (Baker, p. 424). This name has been suggested by Baker to replace *M. castaneae* (Buckton) (preoccupied by *castaneae* (Fitch)). Therefore the name suggested by the author, *M. davidsoni* Swain, must be dropped. Essig (p. 323) lists *M. castaneae* (Fitch), but he refers to this species.

19. *Myzocallis californicus* Baker (Baker, pp. 421-422). This is the same species as described by the author under the name, *Myzocallis maureri* Swain, which name will have to be dropped, and replaced by *M. californicus* Baker.

53a. *Lachnus tomentosus* (De Geer), on *Pinus radiata*, Berkeley (Gillette, pp. 140-141). This species is very similar to *L. pini-radiatae* Davidson, according to Gillette. The author finds on looking over his specimens that some of them labeled *L. pini-radiatae* Dvdn. are this species, particularly those taken on the campus at Berkeley.

56. *Amphorophora latysiphon* Davidson, on *Chrysanthemum* and *Primula* sp., Berkeley (Essig, p. 329).

68. *Macrosiphum granarium* (Kirby), on *Alopecurus pratensis*, *Ampelodesma tenax*, and *Elymus* sp., Martinez (Essig, p. 328).

76. *Macrosiphum rosae* (Linn.) on *Dipsacus fullonum* and *Centranthus ruber*, Berkeley (Essig, p. 329).

79. *Macrosiphum solanifolii* (Ashmead), on *Achillea millefolium* and *Pittosporum tobira*, Berkeley, and on *Ulmus americanus*, San Francisco (Essig, p. 329).

88. *Myzus circumflexus* (Buckton), on *Lilium* spp., *Pentstemon spectabilis*, and *Umbellularia californica*, Berkeley (Essig, p. 335).

102. *Rhopalosiphum lactucae* (Kalt.). Dobrovliansky lists this as a synonym of *R. ribis* (Buckton), giving the latter name preference.

³⁶ Baker, A. C. Eastern aphids, new and little known, II, Jour. Econ. Ent., vol. 10, pp. 421-433, 1917.

Baker, A. C. The correct name for our apple-grain aphid, Science, vol. 46, pp. 410-411, 1917.

Davidson, W. M., The reddish-brown plum aphid, Jour. Econ. Ent., vol. 10, pp. 350-353, 1917.

Dobrovliansky, V. V., A list of aphids found on cultivated plants in the government of Kharkov, in Pests of Agriculture, Kharkov, Bull. 1916; reviewed in Rev. Appl. Ent., vol. 5, pp. 561-562, 1917.

Essig, E. O., Aphididae of California, Univ. Calif. Publ. Entom., vol. 1, pp. 301-346, 1917.

Gillette, C. P., Some Colorado species of the genus *Lachnus*, Ent. Soc. Am., vol. 10, pp. 133-146, 1917.

Van der Goot, P., Zur Kenntnis der Blattläuse Java's, in Contrib. à la fauna der Indes néerlandaises, vol. 1, pp. 1-301, 1916.

104. *Rhopalosiphum persicae* (Sulzer), on *Baccharis douglasii*, *Centranthus ruber*, *Clarkia elegans*, *Dipsacus fullonum*, *Escallonia pulverulenta*, *Helianthus annuus*, *Lavatera assurgentiflora*, *Liriodendron tulipifera*, *Melianthus major*, *Pentstemon spectabilis*, *Pittosporum* spp., and *Umbellularia californica*, Berkeley (Essig, pp. 331-332).

111. *Aphis avenae* Fabr. It would appear from a study of Baker's paper in *Science* that the common California species is *Aphis prunifoliae* Fitch. It is certain that it is distinct from *A. cerasifoliae* Fitch, which has been taken here once and is described in this paper. If it is possible, as Baker says, that *A. cerasifoliae* Fitch is a synonym of *A. padi* Linn., then our common species must be known as *A. prunifoliae* Fitch. From the brief description of *Aphis* (*Siphonaphis*) *padi* Linn. given by Van der Goot (pp. 71-72) it would appear that our species may be distinct, differing slightly in the comparative lengths of the cornicles and cauda. Consequently the author favors accepting the name, *Aphis prunifoliae* Fitch, for this species.

123. *Aphis gossypii* Glover, on *Asclepias speciosa*, *A. vestita*, *Lilium speciosum rubrum*, *Lonicera* sp., and *Rhamnus purshiana*, Berkeley and Oakland (Essig, pp. 338-339).

131. *Aphis medicaginis* Koch, on *Citrus* sp., Sacramento, and on *Vigna sinensis*, Moorpark (Essig, p. 340).

139. *Aphis pomi* De Geer, on *Cotoneaster franchetii*, *Pittosporum eugenioides*, and *Viburnum tinus*, Berkeley (Essig, p. 341). The author is inclined to believe this to be *Aphis viburnicolens* n.sp. (see no. 150) which is quite similar to *Aphis pomi* De Geer, but which is common on *Viburnum* and related plants. He has not, however, seen Essig's specimens, so can not state positively whether or not it is this species.

140. *Aphis prunorum* Dobr. Dobrovliansky places this species as a synonym of *Siphocoryne nymphaeae* (Linn.). This author noted the similarity of these two, but was not certain of their identity, so listed them as distinct species.

141. *Aphis pseudobrassicæ* Davis. Dobrovliansky believes this to be a synonym of *Aphis erysimi* Kalt.

146. *Aphis senecio* Swain. Essig (p. 337) lists *Aphis bakeri* Cowen from *Trifolium pratense*. This proves to be the true *Aphis bakeri* Cowen and not *A. senecio* Swain, which is the species that has been hitherto called *A. bakeri* Cowen in California.

152. *Toxoptera aurantii* (Fonse.) on *Camellia japonica*, Oakland (Essig, p. 330).

153. *Hyalopterus arundinis* (Fabr.). Both Dobrovliansky and Van der Goot list this as a synonym of *H. pruni* (Fabr.) giving the later preference. According to Hunter, *arundinis* should have priority, but it is entirely possible that the dates he gives are incorrect. This point the author is unable to settle as he has not access to Fabricius' works.

156. *Siphocoryne nymphaeae* (Linn.). Davidson gives a brief account of the habits and biology of this species, as well as a description of the various forms.

175. *Eriosoma languinosa* Hartig (*pyricola* Baker and Davidson). The species listed by Essig (p. 345) as *Eriosoma* sp. on *Ulmus campestris* in Berkeley and in Hayward is this species.

115. *Aphis cari* Essig. Davidson recently remarked to the author that he could see no difference between this species and *Aphis helianthii* Monell. It is quite possible that these are synonyms.

EXPLANATION OF PLATES

PLATE 1

- Fig. 1. *Myzocallis asclepiadis* (Fitch), tarsus and claw.
Fig. 2. *Aphis senecio* Swain, tarsus and claw.
Fig. 3. *Essigella californica* (Essig), sixth antennal segment and spur.
Fig. 4. *Aphis senecio* Swain, sixth antennal segment and spur.
Fig. 5. *Essigella californica* (Essig), cauda and anal plate (lateral view).
Fig. 6. *Aphis senecio* Swain, cauda and anal plate (lateral view).
Fig. 7. *Eucallipterus tiliae* (Linn.), cauda and anal plate.
Fig. 8. *Thomasia populicola* (Thos.), cauda and anal plate.
Fig. 9. *Phyllaphis fagi* (Linn.), third antennal segment.
Fig. 10. *Phyllaphis fagi* (Linn.), sixth antennal segment.
Fig. 11. *Phyllaphis fagi* (Linn.), caudad and anal plate.
Fig. 12. *Phyllaphis fagi* (Linn.), front of head and antennal tubercles.
Fig. 13. *Phyllaphis coweni* (Ckll.), Antenna.
Fig. 14. *Phyllaphis quercicola* Baker, third antennal segment.
Fig. 15. *Phyllaphis quercicola* Baker, fourth antennal segment.
Fig. 16. *Phyllaphis quercicola* Baker, fifth antennal segment.
Fig. 17. *Phyllaphis quercicola* Baker, sixth antennal segment.
Fig. 18. *Phyllaphis quercicola* Baker, forewing.
Fig. 19. *Phyllaphis quercicola* Baker, cauda and anal plate.
Fig. 20. *Phyllaphis querci*, tarsal claw.
Fig. 21. *Drepanosiphum platanoides* (Schr.), antennal tubercles.

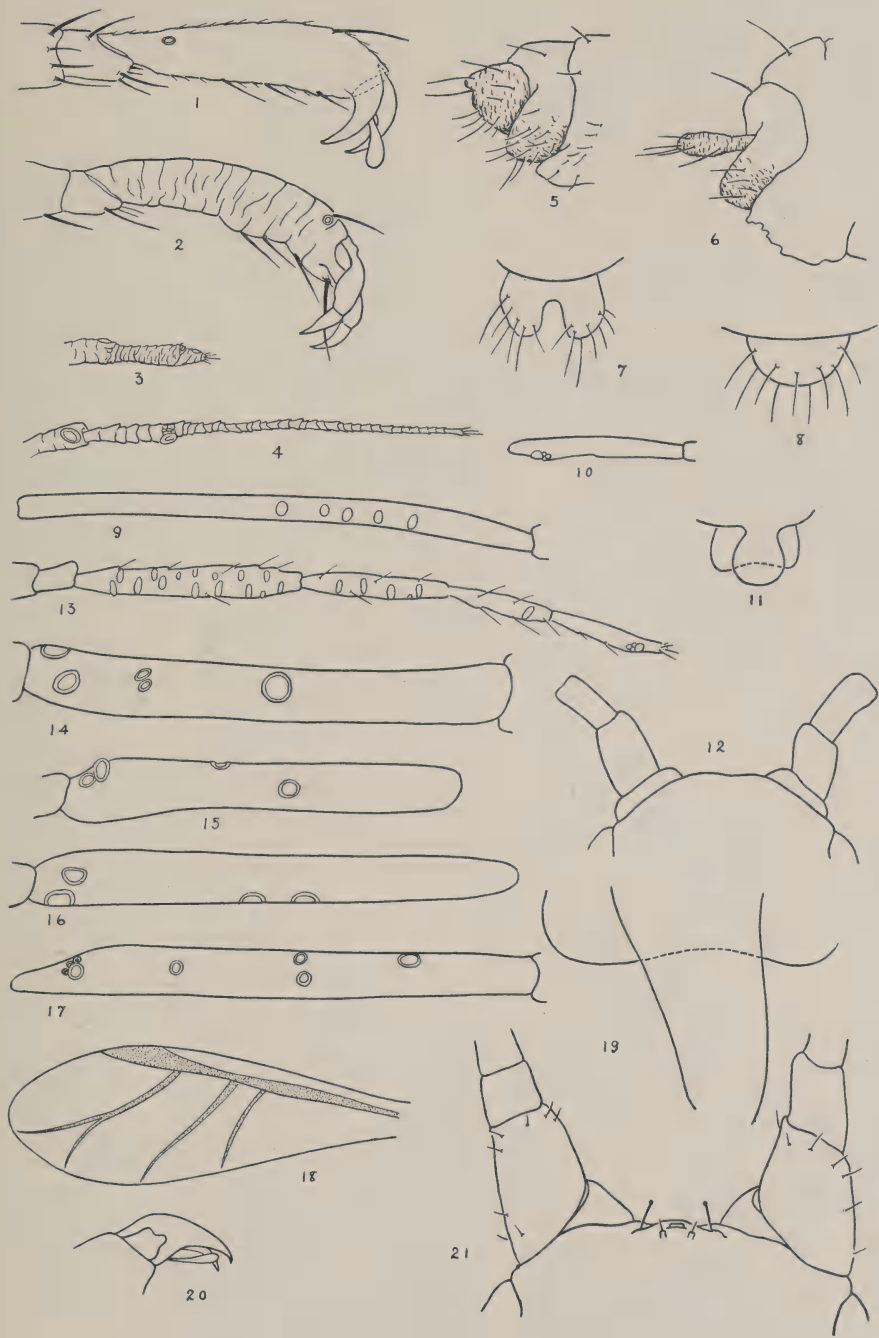


PLATE 2

- Fig. 22. *Myzocallis arundicolens* (Clarke), antennal tubercles.
- Fig. 23. *Drepanaphis acerifolii* (Thomas), cornicle.
- Fig. 24. *Drepanosiphum platanoides* (Schr.), cornicle.
- Fig. 25. *Monellia caryella* (Fitch), cornicle.
- Fig. 26. *Myzocallis bellus* (Walsh), cornicle.
- Fig. 27. *Calaphis betulaecolens* (Fitch), antennal tubercles.
- Fig. 28. *Calaphis betulella* Walsh, antennal tubercles.
- Fig. 29. *Euceraphis betulae* (Koch), antennal tubercles.
- Fig. 30. *Eucallipterus tiliae* (Linn.), sixth antennal segment and spur.
- Fig. 31. *Myzocallis quercus* (Kalt.), sixth antennal segment and spur.
- Fig. 32. *Myzocallis quercus* (Kalt.), cornicle.
- Fig. 33. *Eucallipterus tiliae* (Linn.), cornicle.
- Fig. 34. *Chromaphis juglandicola* (Kalt.), sixth antennal segment and spur.
- Fig. 35. *Chromaphis juglandicola* (Kalt.), cornicle.
- Fig. 36. *Drepanosiphum platanoides* (Schr.), third antennal segment.
- Fig. 37. *Drepanaphis acerifolii* (Thomas), third antennal segment.
- Fig. 38. *Calaphis betulae-colens* (Fitch), third antennal segment.
- Fig. 39. *Euceraphis gillettei* Dvdn., base of third antennal segment.
- Fig. 40. *Euceraphis betulae* (Koch), base of third antennal segment.

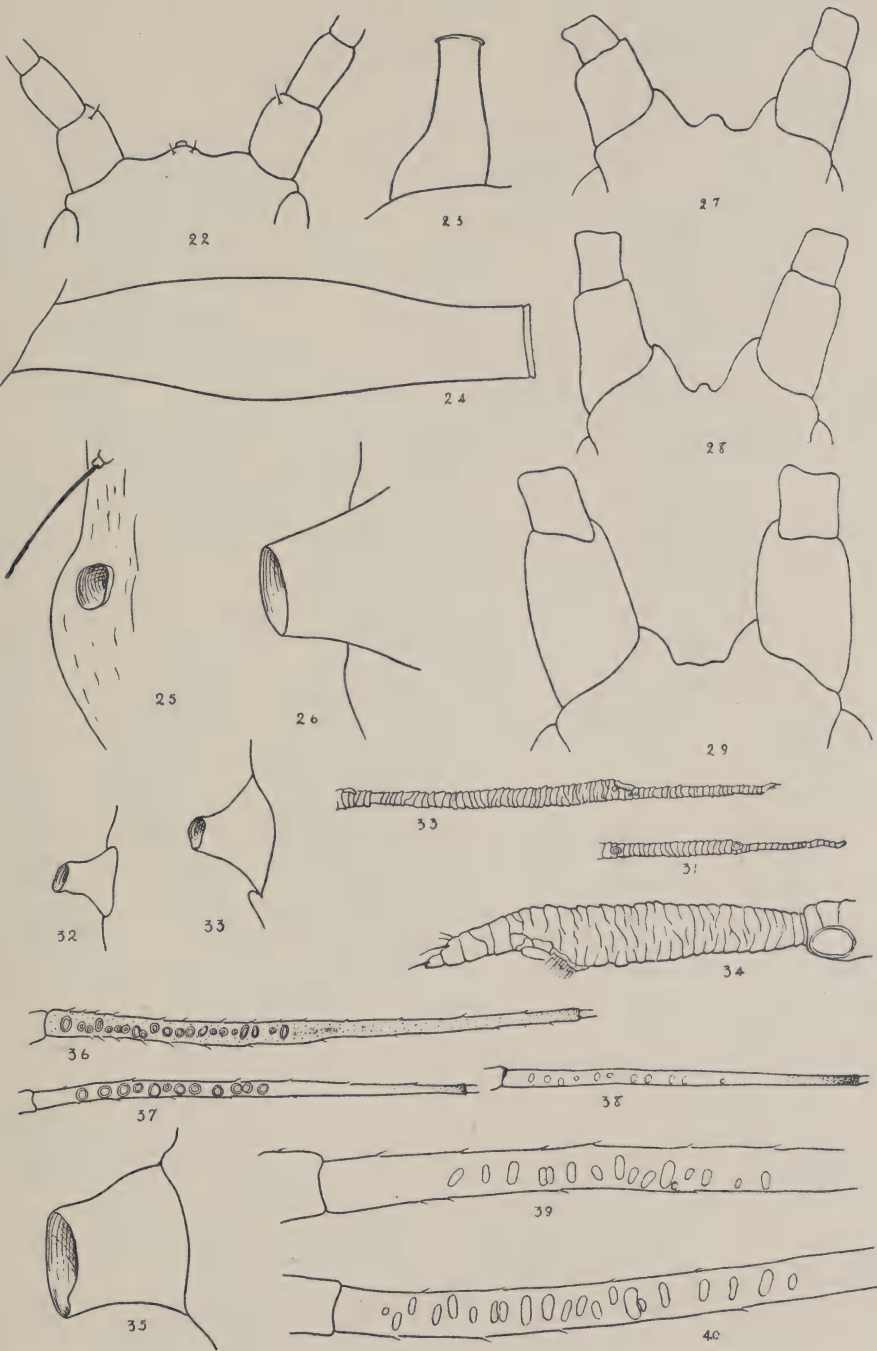


PLATE 3

- Fig. 41. *Eucallipterus flava* (Dvdn.), base of third antennal segment.
- Fig. 42. *Eucallipterus tiliae* (Linn.), third antennal segment.
- Fig. 43. *Myzocallis coryli* (Goetze), third antennal segment.
- Fig. 44. *Myzocallis coryli* (Goetze), sixth antennal segment and spur.
- Fig. 45. *Myzocallis bellus* (Walsh), sixth antennal segment and spur.
- Fig. 46. *Myzocallis bellus* (Walsh), third antennal segment.
- Fig. 47. *Myzocallis alnifoliae* (Fitch), third antennal segment.
- Fig. 48. *Myzocallis arundicolens* (Clarke), third antennal segment.
- Fig. 49. *Eucallipterus tiliae* (Linn.), cornicle.
- Fig. 50. *Eucallipterus tiliae* (Linn.), anal plate.
- Fig. 51. *Myzocallis arundicolens* (Clarke), cornicle.
- Fig. 52. *Myzocallis arundicolens* (Clarke), anal plate.
- Fig. 53. *Myzocallis coryli* (Goetze), cornicle.
- Fig. 54. *Myzocallis coryli* (Goetze), anal plate.
- Fig. 55. *Myzocallis californicus* Baker, third antennal segment.
- Fig. 56. *Myzocallis californicus* Baker, sixth antennal segment and spur.
- Fig. 57. *Myzocallis pasaniae* Dvdn., third antennal segment.
- Fig. 58. *Myzocallis quercus* (Kalt.), third antennal segment.
- Fig. 59. *Myzocallis ulmifolii* (Monell), third antennal segment.
- Fig. 60. *Myzocallis castanicola* Baker, third antennal segment.
- Fig. 61. *Myzocallis castanicola* Baker, cauda and anal plate.
- Fig. 62. *Myzocallis castanicola* Baker, cornicle.
- Fig. 63. *Callipterus californicus* (Essig), sixth antennal segment and spur.
- Fig. 64. *Callipterus californicus* (Essig), third antennal segment.
- Fig. 65. *Callipterus caryae* Monell, third antennal segment.

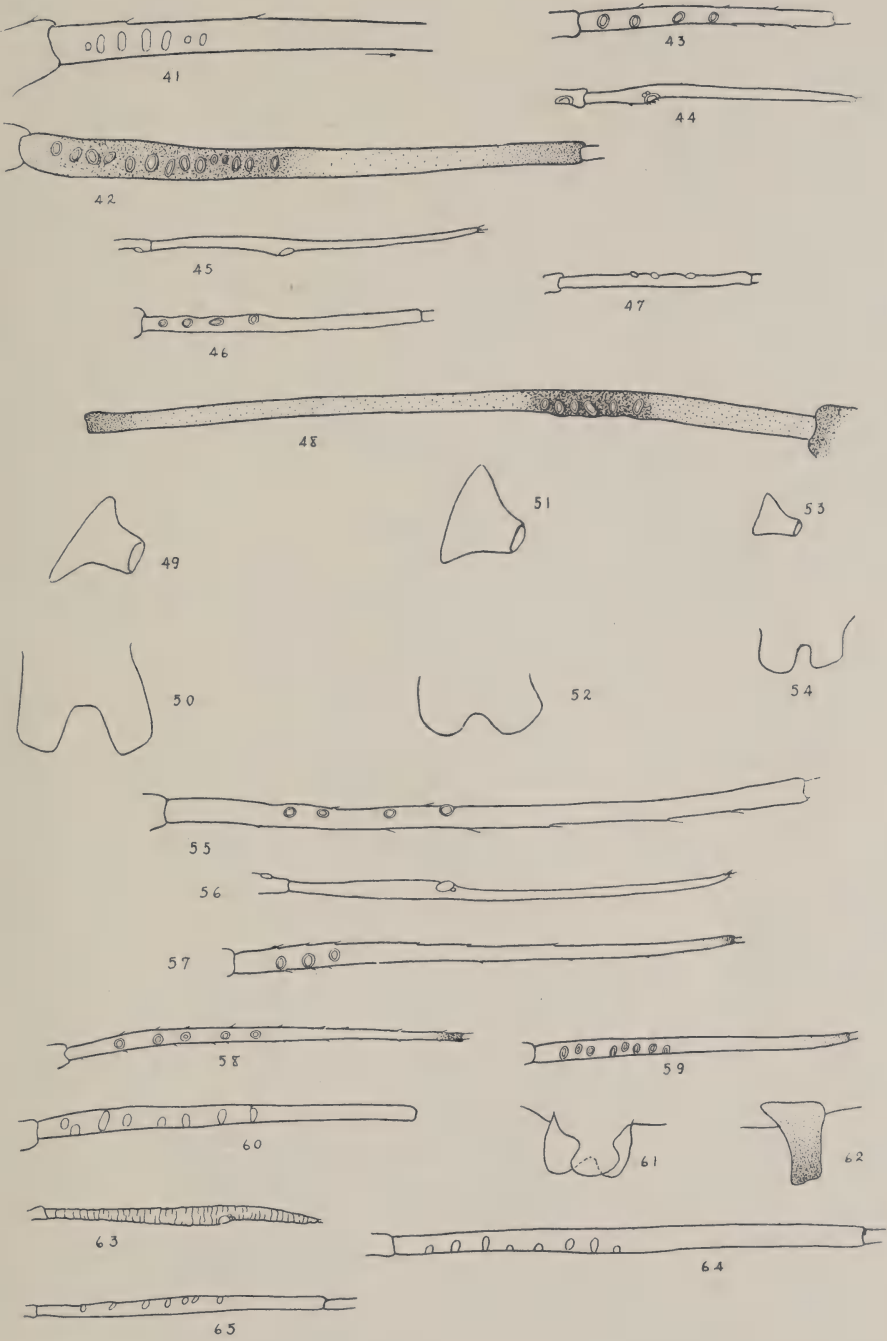


PLATE 4

- Fig. 66. *Callipterus caryae* Monell, sixth antennal segment and spur.
Fig. 67. *Monellia caryella* (Fitch), sixth antennal segment and spur.
Fig. 68. *Monellia caryella* (Fitch), third antennal segment.
Fig. 69. *Arctaphis populifolii* (Essig), cauda.
Fig. 70. *Micrella monella* Essig, cauda.
Fig. 71. *Arctaphis populifolii* (Essig), third antennal segment.
Fig. 72. *Micrella monella* Essig, third antennal segment.
Fig. 73. *Symydobius macrostachyae* Essig, third antennal segment.
Fig. 74. *Symydobius salicicorticis* Essig, third antennal segment.
Fig. 75. *Fullawaya saliciradicis* Essig, third antennal segment.
Fig. 76. *Thomasia crucis* Essig, third antennal segment.
Fig. 77. *Thomasia populicola* (Thomas), third antennal segment.
Fig. 78. *Thomasia salicicola* (Essig), third antennal segment.
Fig. 79. *Lachnus ferrisi* Swain, tarsal claw.
Fig. 80. *Pterocomma populifoliae* (Fitch), tarsal claw.
Fig. 81. *Pterocomma flocculosa* (Weed), cornicle.
Fig. 82. *Pterocomma populifoliae* (Fitch), cornicle.
Fig. 83. *Essigella californica* (Essig), antenna.
Fig. 84. *Longistigma* sp., front wing.

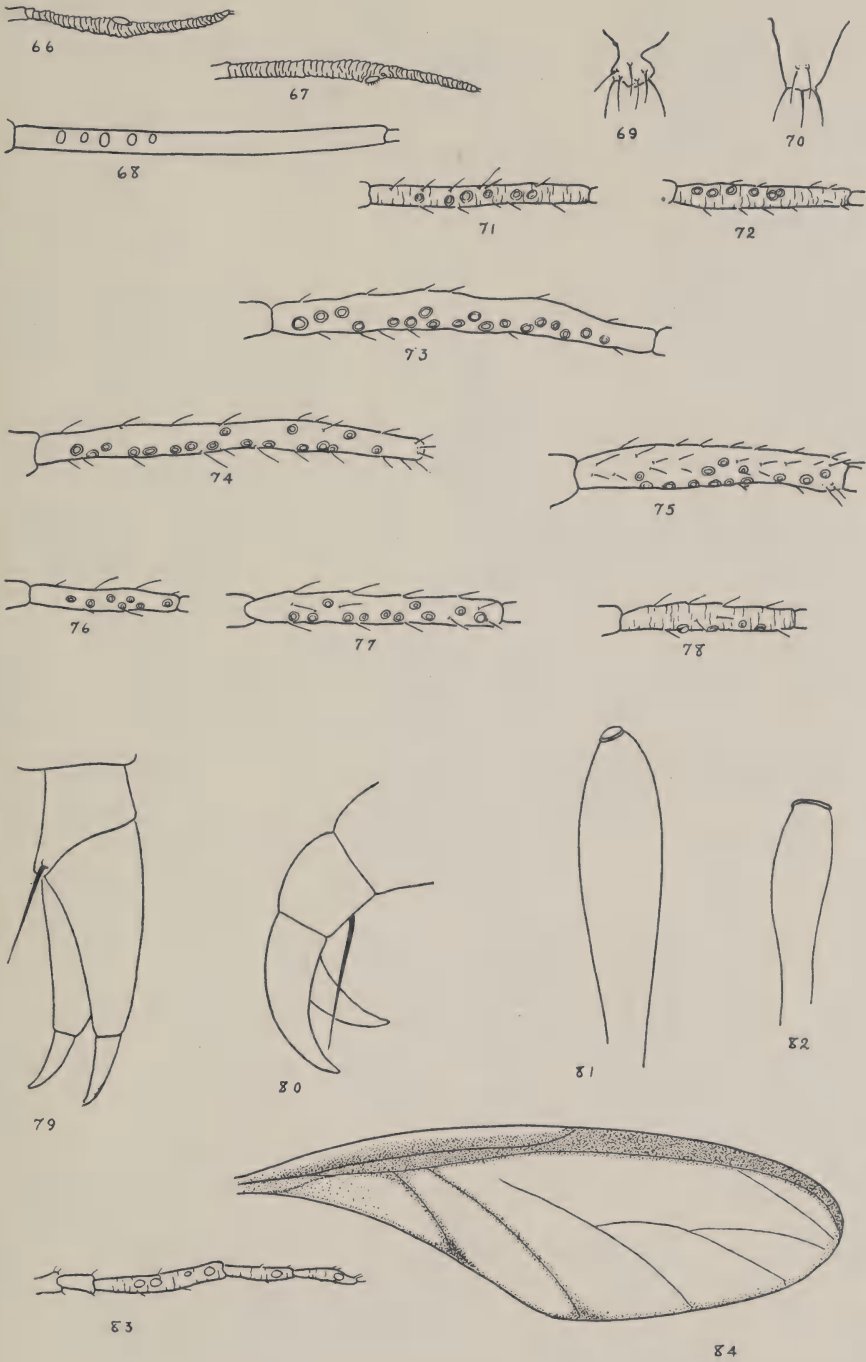


PLATE 5

- Fig. 85. *Lachnus* sp., front wing.
- Fig. 86. *Tuberolachnus viminalis* (Fonse.), hind tarsus.
- Fig. 87. *Eulachnus rileyi* Davis, hind tarsus.
- Fig. 88. *Lachnus vanduzeei* n.sp., third antennal segment.
- Fig. 89. *Lachnus ferrisi* Swain, first, second, and third antennal segments.
- Fig. 90. *Lachnus ferrisi* Swain, fourth, fifth, and sixth antennal segments.
- Fig. 91. *Lachnus ferrisi* Swain, cornicle.
- Fig. 92. *Lachnus pseudotsugae* Wilson, tip of front wing.
- Fig. 93. *Lachnus tujafilinus* (Del Guercio), tip of front wing.
- Fig. 94. *Lachnus occidentalis* Dvdn., third antennal segment.
- Fig. 95. *Lachnus pini-radiatae* Dvdn. (?), third antennal segment.
- Fig. 96. *Lachnus glehnus* Essig, third antennal segment.
- Fig. 97. *Lachnus glehnus* Essig, cornicle.
- Fig. 98. *Lachnus pseudotsugae* Wilson, third antennal segment.
- Fig. 99. *Lachnus taxifolia* Swain, hind tarsus.
- Fig. 100. *Lachnus taxifolia* Swain, fourth, fifth and sixth antennal segments.
- Fig. 101. *Lachnus taxifolia* Swain, first, second, and third antennal segments.

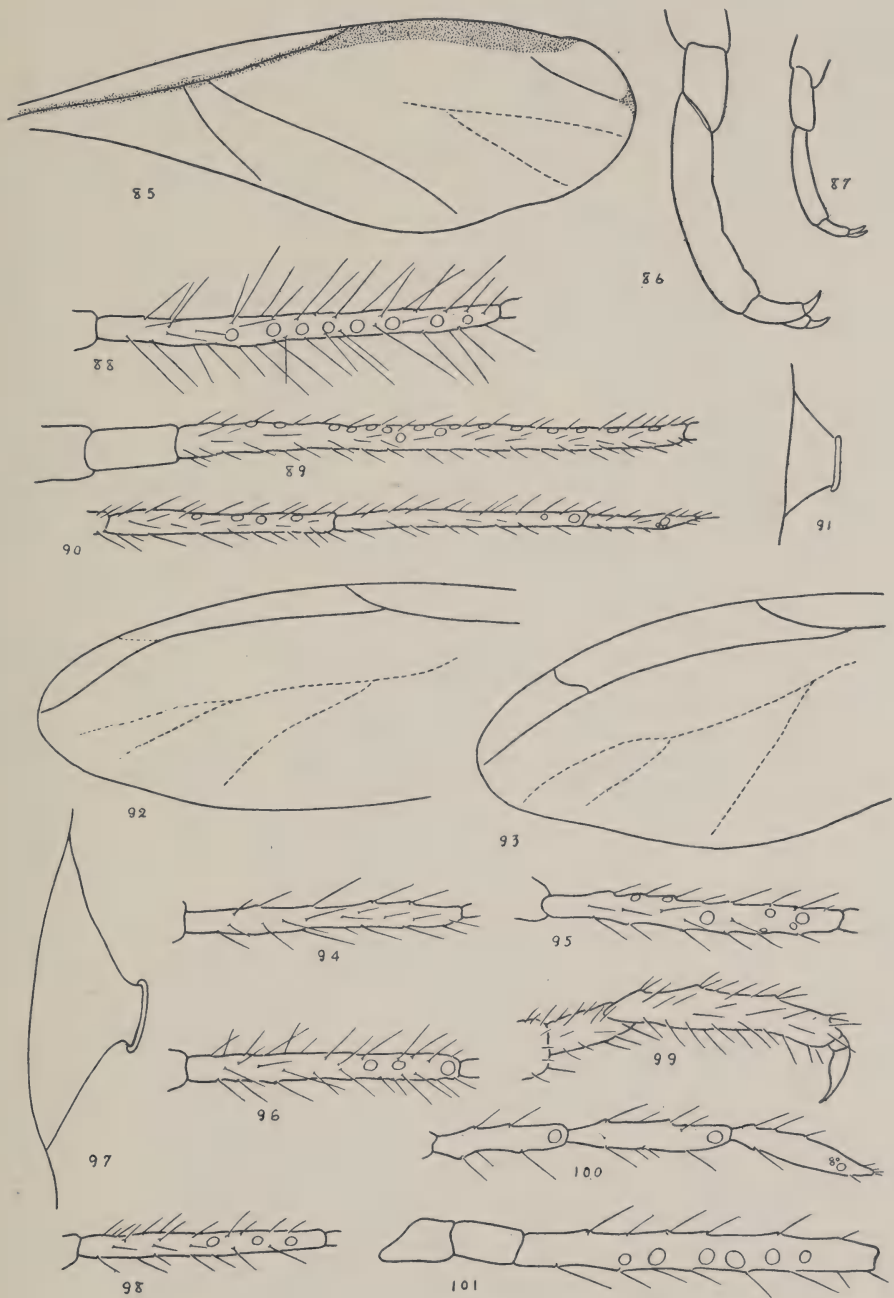


PLATE 6

- Fig. 102. *Lachnus taxifolia* Swain, wing.
Fig. 103. *Lachnus taxifolia* Swain, cornicle of apterous female.
Fig. 104. *Lachnus ponderosa* Williams, third antennal segment.
Fig. 105. *Lachnus tujaefilinus* (Del Guercio), third antennal segment.
Fig. 106. *Macrosiphum rosae* (Linn.), antennal tubercles.
Fig. 107. *Nectaro-siphon rubicola* (Oest.), antennal tubercles.
Fig. 108. *Rhopalosiphum persicae* (Sulz.), antennal tubercles.
Fig. 109. *Nectarosiphon rubicola* (Oest.), cornicle.
Fig. 110. *Idiopterus nephrolepidis* Davis, wing.
Fig. 111. *Amphorophora rubi* (Kalt.), antennal tubercles.
Fig. 112. *Myzus cerasi* (Fabr.), antennal tubercles.
Fig. 113. *Amphorophora rubi* (Kalt.), cornicle.
Fig. 114. *Toxoptera aurantii* (Fonse.), cornicle.
Fig. 115. *Phorodon humuli* (Schr.), antennal tubercles of alate females.
Fig. 116. *Phorodon humuli* (Schr.), antennal tubercles of apterous females.

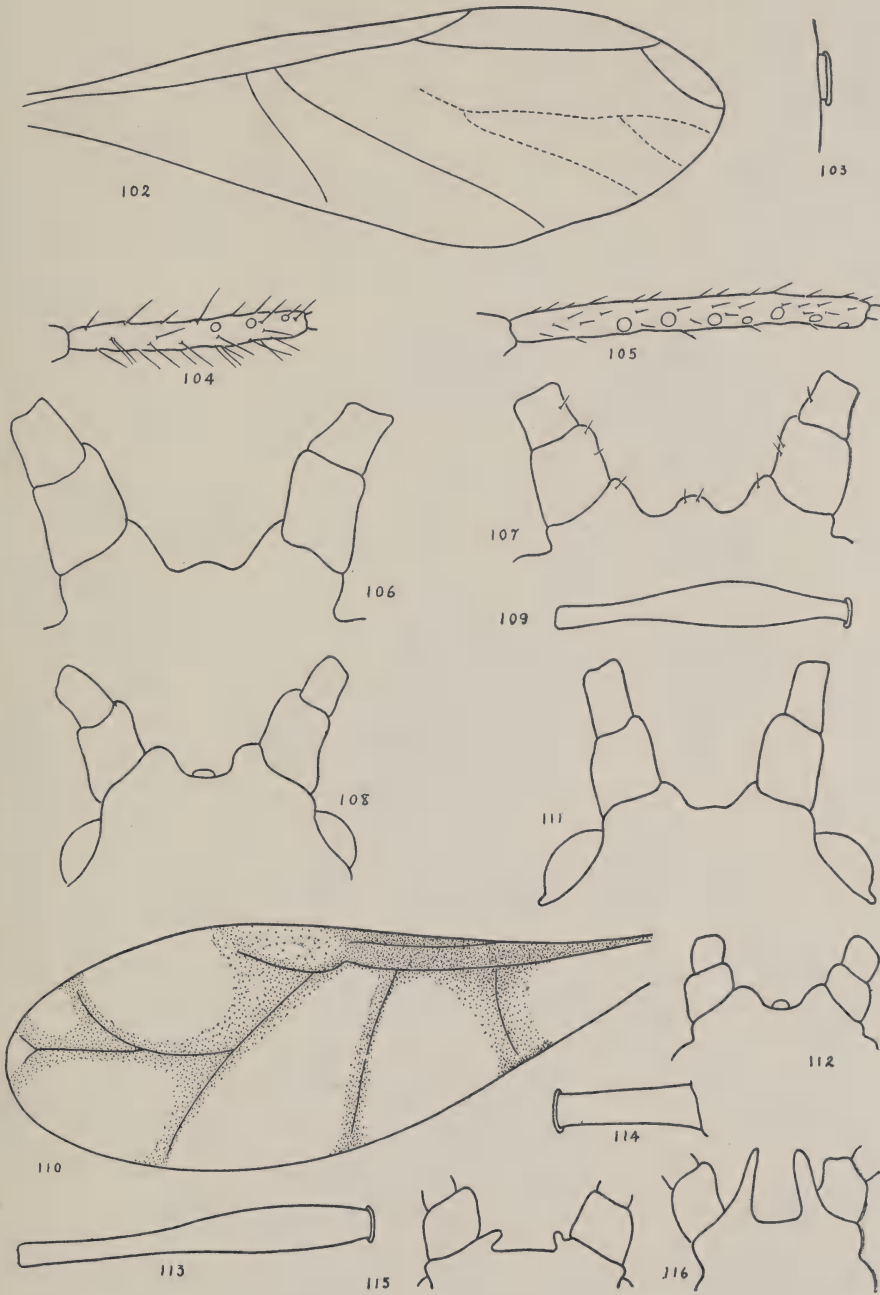


PLATE 7

- Fig. 117. *Phorodon humuli* Schr., cornicle.
- Fig. 118. *Phorodon humuli* Schr., cauda.
- Fig. 119. *Rhopalosiphum persicae* (Sulz.), cornicle.
- Fig. 120. *Rhopalosiphum psicae* (Sulz.), cauda.
- Fig. 121. *Myzus cerasi* (Fabr.), cornicle.
- Fig. 122. *Myzus cerasi* (Fabr.), cauda.
- Fig. 123. *Nectarosiphon rubicola* (Oest.), cauda.
- Fig. 124. *Nectarosiphon morrisoni* Swain, antennal tubercles.
- Fig. 125. *Nectarosiphon morrisoni* Swain, third antennal segment.
- Fig. 126. *Nectarosiphon morrisoni* Swain, cauda.
- Fig. 127. *Nectarosiphon morrisoni* Swain, cornicle.
- Fig. 128. *Macrosiphum stanleyi* Wilson, cornicle.
- Fig. 129. *Macrosiphum solanifolii* (Ashm.) (from *Sonchus*), cornicle.
- Fig. 130. *Macrosiphum pisi* (Kalt.), cornicle.
- Fig. 131. *Macrosiphum californicum* (Clarke), third antennal segment.
- Fig. 132. *Macrosiphum californicum* (Clarke), cornicle.
- Fig. 133. *Macrosiphum cucurbitae* (Thomas), third antennal segment.
- Fig. 134. *Macrosiphum cucurbitae* (Thomas), cornicle.
- Fig. 135. *Macrosiphum granarium* (Kirby), third antennal segment.
- Fig. 136. *Macrosiphum ludoviciana* (Oest.), third antennal segment.
- Fig. 137. *Macrosiphum solanifolii* (Ashm.), cornicle.
- Fig. 138. *Macrosiphum solanifolii* (Ashm.), third antennal segment.

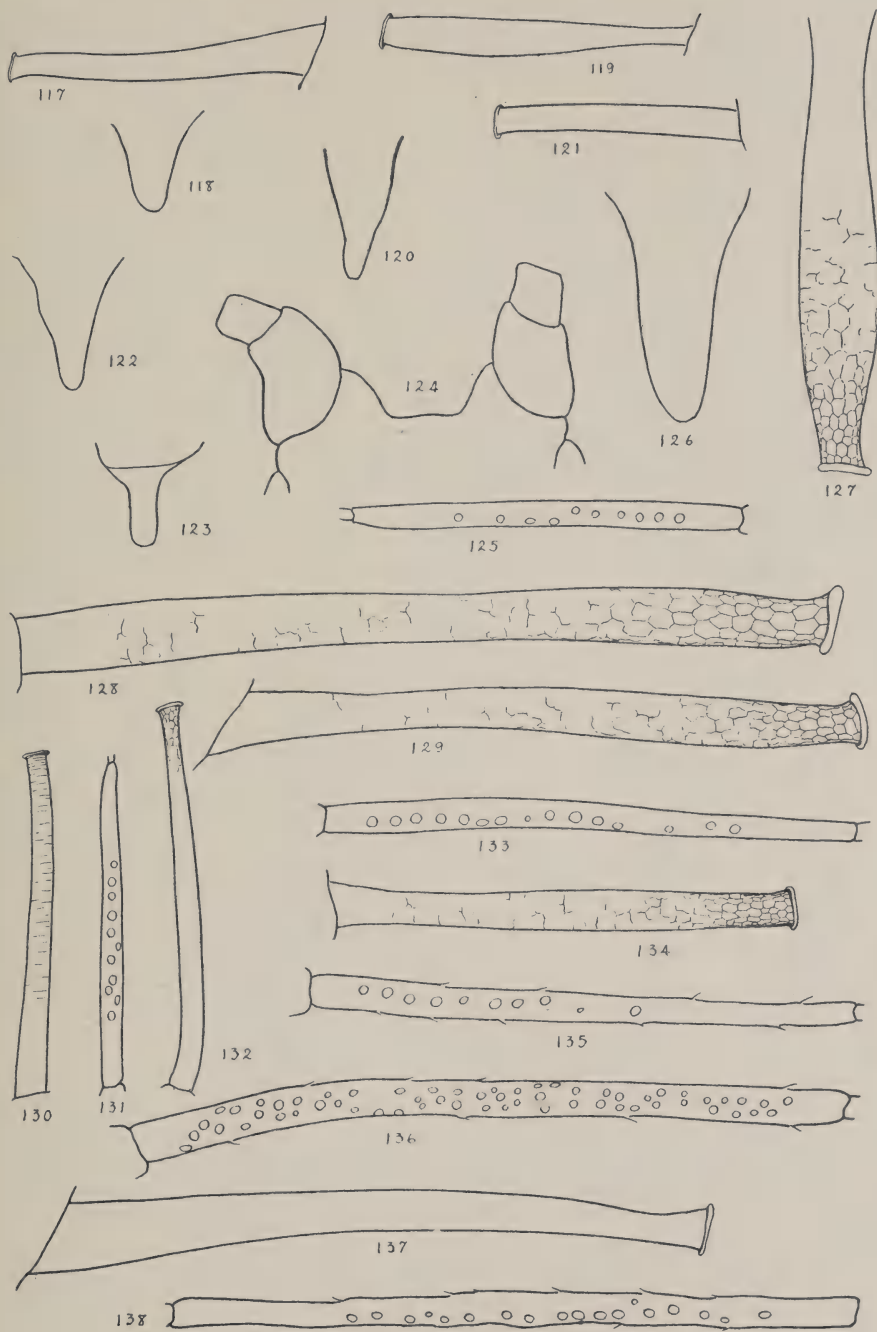


PLATE 8

- Fig. 139. *Macrosiphum solanifolii* (Ashm.) (from *Citrus*), cornicle.
- Fig. 140. *Macrosiphum solanifolii* (Ashm.) (from *Citrus*), third antennal segment.
- Fig. 141. *Macrosiphum sanborni* Gillette, cornicle of apterous female.
- Fig. 142. *Macrosiphum artemisiae* (Fonse.), cornicle.
- Fig. 143. *Macrosiphum albifrons* Essig, third antennal segment.
- Fig. 144. *Macrosiphum albifrons* Essig, cornicle.
- Fig. 145. *Macrosiphum artemisiae* (Fonse.), third antennal segment.
- Fig. 146. *Macrosiphum artemisicola* (Williams), third antennal segment.
- Fig. 147. *Macrosiphum artemisicola* (Williams), cornicle.
- Fig. 148. *Macrosiphum granarium* (Kirby), cornicle.
- Fig. 149. *Macrosiphum ludoviciana* (Oest.), cornicle.
- Fig. 150. *Macrosiphum pisi* (Kalt.), third antennal segment.
- Fig. 151. *Macrosiphum rosae* (Linn.), third antennal segment.
- Fig. 152. *Macrosiphum rosae* (Linn.), cornicle.
- Fig. 153. *Macrosiphum rudbeckiae* (Fitch), cornicle.
- Fig. 154. *Macrosiphum rudbeckiae* (Fitch), third antennal segment.
- Fig. 155. *Macrosiphum sanborni* Gillette, cauda apterous female.
- Fig. 156. *Macrosiphum dirhodum* (Walker), cornicle.
- Fig. 157. *Macrosiphum dirhodum* (Walker), third antennal segment.
- Fig. 158. *Macrosiphum stanleyi* Wilson, third antennal segment.
- Fig. 159. *Macrosiphum solanifolii* (Ashm.) (from *Souchus*), third antennal segment.
- Fig. 160. *Macrosiphum solanifolii* (Ashm.) (from *Sonchus*), cauda.

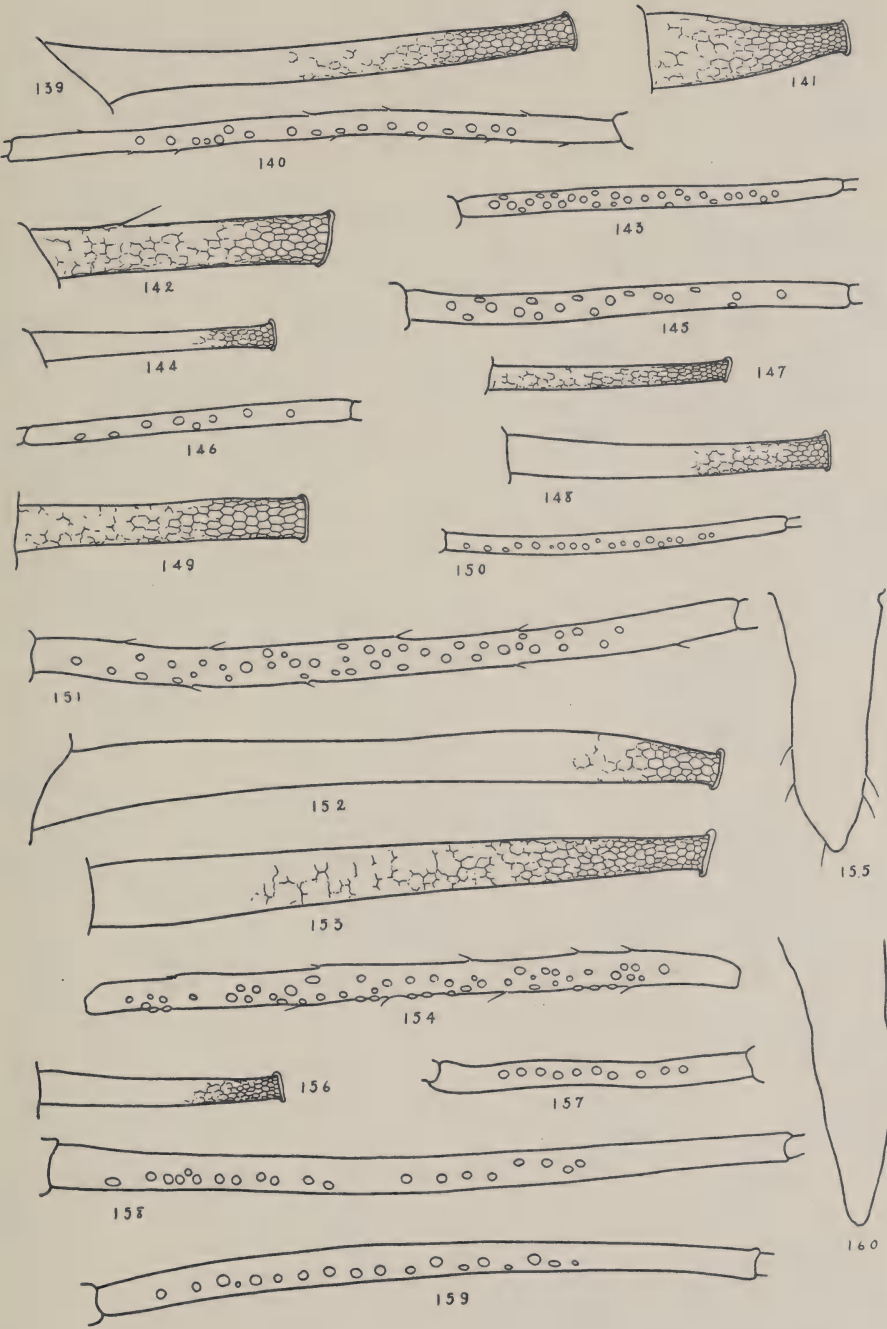


PLATE 9

- Fig. 161. *Amphorophora latysiphon* Dvdn., cornicle.
- Fig. 162. *Amphorophora rubi* (Kalt.), cauda.
- Fig. 163. *Toxoptera aurantii* (Fonse.), third antennal segment.
- Fig. 164. *Rhopalosiphum violae* Pergande, wing.
- Fig. 165. *Rhopalosiphum hippophaes* Koch, cornicle.
- Fig. 166. *Rhopalosiphum nervatum* Gillette (from *Arbutus*), wing.
- Fig. 167. *Rhopalosiphum corylinum* Dvdn., third antennal segment.
- Fig. 168. *Rhopalosiphum persicae* (Sulz.), third antennal segment.
- Fig. 169. *Rhopalosiphum nervatum* Gillette (from *Arbutus*), third antennal segment.
- Fig. 170. *Rhopalosiphum hippophaes* Koch, third antennal segment.
- Fig. 171. *Rhopalosiphum nervatum* Gillette (from rose), third antennal segment.
- Fig. 172. *Siphocoryne nymphaeae* (Linn.), third antennal segment.
- Fig. 173. *Rhopalosiphum rhois* Monell, third antennal segment.
- Fig. 174. *Rhopalosiphum violae* Pergande, third antennal segment.
- Fig. 175. *Myzus circumflexus* (Buckton), third antennal segment.
- Fig. 176. *Myzus braggii* Gillette, third antennal segment.
- Fig. 177. *Myzus fragaefolii* O'kell, third antennal segment.
- Fig. 178. *Myzus rhamni* (Fonse.), third antennal segment.
- Fig. 179. *Myzus cerasi* (Fabr.), third antennal segment.
- Fig. 180. *Myzus ribis* (Linn.), third antennal segment.
- Fig. 181. *Hyalopterus arundinis* (Fabr.), cornicle.
- Fig. 182. *Aphis euonomi* Fabr., cornicle.
- Fig. 183. *Siphocoryne capreae* (Fabr.), cornicle.
- Fig. 184. *Liosomaphis berberidis* (Kalt.), cornicle.
- Fig. 185. *Hyalopterus arundinis* (Fabr.), third and fourth antennal segments.
- Fig. 186. *Hyalopterus arundinis* (Fabr.), cauda.

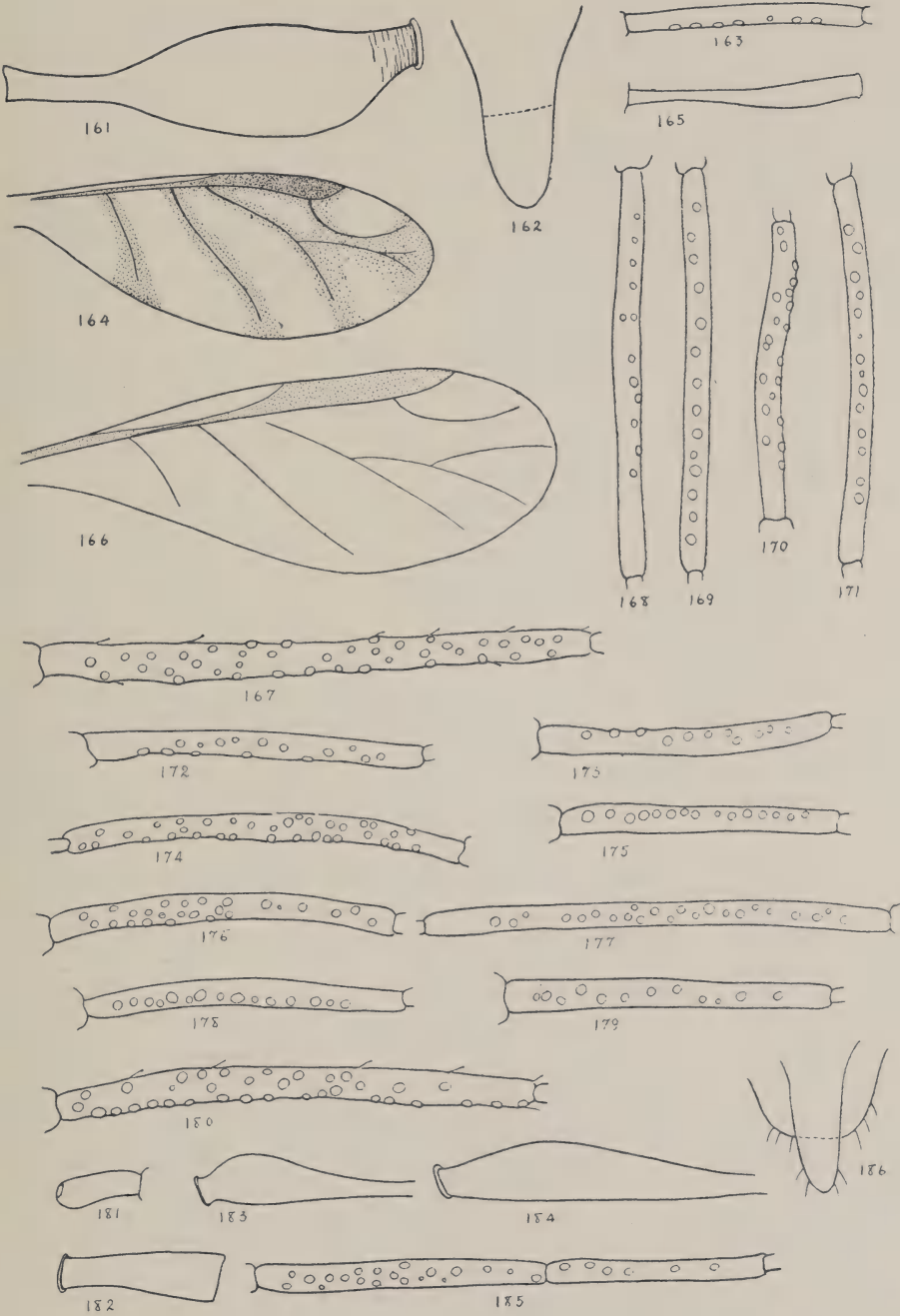


PLATE 10

- Fig. 187. *Aphis euonomi* Fabr., wing.
- Fig. 188. *Aphis salicicola* Thomas, wing.
- Fig. 189. *Aphis medicaginis* Koch, third and fourth antennal segments.
- Fig. 190. *Aphis euonomi* Fabr. (?), third and fourth antennal segments.
- Fig. 191. *Aphis avenae* Fabr., wing.
- Fig. 192. *Aphis gossypii* Glover, cornicle.
- Fig. 193. *Aphis gossypii* Glover, cauda.
- Fig. 194. *Aphis sambucifoliae* Fitch, cauda.
- Fig. 195. *Aphis sambucifoliae* Fitch, cornicle.
- Fig. 196. *Myzaphis abietina* (Walker), third and fourth antennal segments.
- Fig. 197. *Myzaphis abietina* (Walker), cornicle.
- Fig. 198. *Aphis albipes* Oest., cornicle.
- Fig. 199. *Aphis albipes* Oest., cauda.
- Fig. 200. *Aphis albipes* Oest., third and fourth antennal segments.
- Fig. 201. *Aphis avenae* Fabr., cornicle.
- Fig. 202. *Aphis avenae* Fabr., third and fourth antennal segments.
- Fig. 203. *Aphis brassicae* Linn., cornicle.
- Fig. 204. *Aphis brassicae* Linn., third and fourth antennal segments.
- Fig. 205. *Aphis euonomi* Fabr., cornicle.
- Fig. 206. *Aphis euonomi* Fabr., cornicle.
- Fig. 207. *Aphis euonomi* Fabr., third and fourth antennal segments.
- Fig. 208. *Aphis cardui* Linn., third and fourth antennal segments.
- Fig. 209. *Aphis cardui* Linn., cornicle.
- Fig. 210. *Aphis ceanothi* Clarke, cornicle.
- Fig. 211. *Aphis ceanothi* Clarke, third and fourth antennal segments.
- Fig. 212. *Aphis cookii* Essig, third and fourth antennal segments.
- Fig. 213. *Aphis cookii* Essig, cauda and anal plate.
- Fig. 214. *Aphis cookii* Essig, cornicle.
- Fig. 215. *Aphis gossypii* Glover, third and fourth antennal segments.
- Fig. 216. *Aphis maidis* Fitch, cauda.
- Fig. 217. *Aphis maidis* Fitch, antenna.
- Fig. 218. *Aphis maidis* Fitch, cornicle.
- Fig. 219. *Aphis middletonii* Thomas, cornicle.
- Fig. 220. *Aphis middletonii* Thomas, third and fourth antennal segments.
- Fig. 221. *Aphis nerii* Fonse., cornicle.
- Fig. 222. *Aphis nerii* Fonse., third and fourth antennal segments.
- Fig. 223. *Aphis persicae-niger* Smith, cornicle.
- Fig. 224. *Aphis persicae-niger* Smith, third and fourth antennal segments.

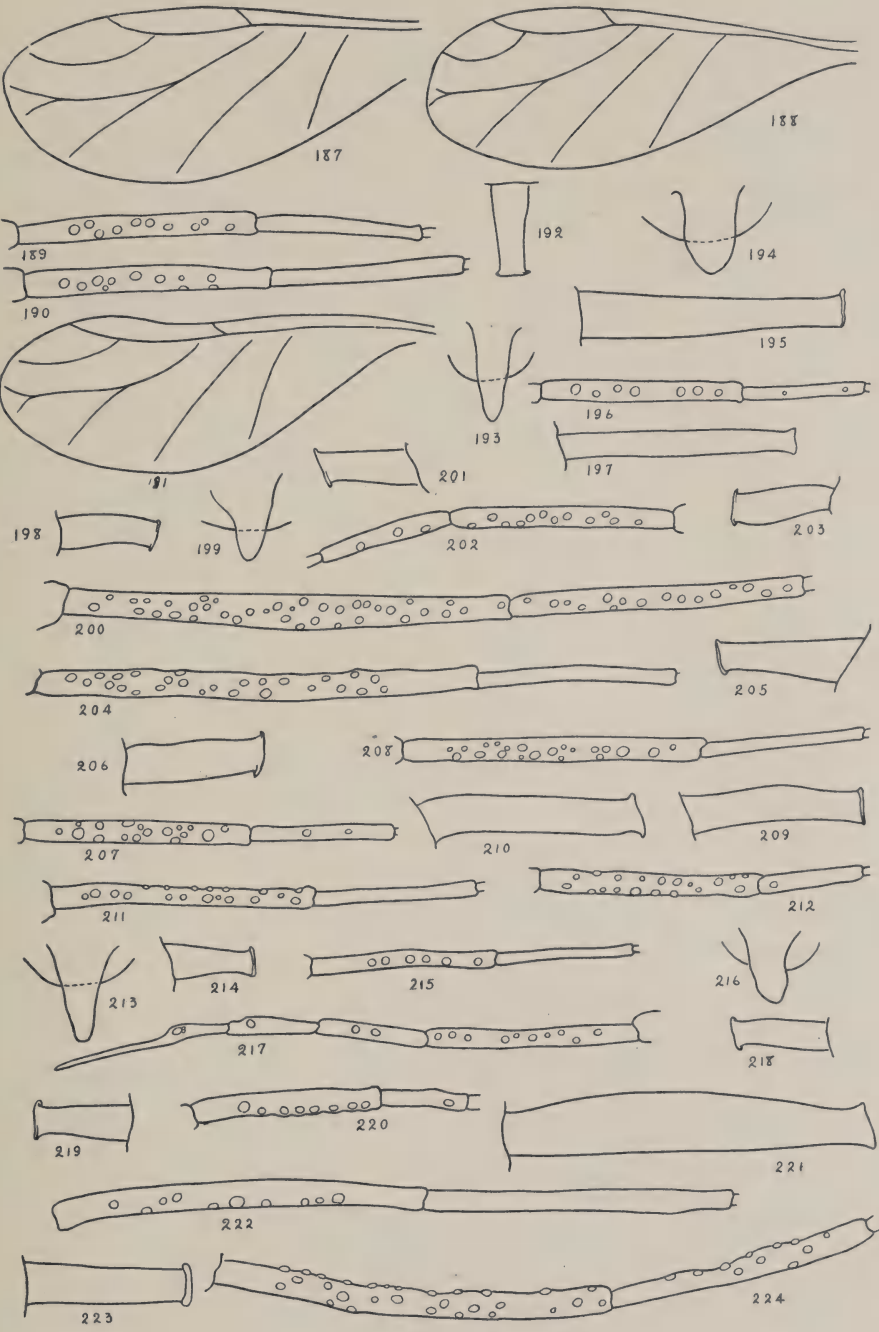


PLATE 11

- Fig. 225. *Aphis pomi* De Geer, cauda.
 Fig. 226. *Aphis pomi* De Geer, antennae.
 Fig. 227. *Aphis pomi* De Geer, cornicle.
 Fig. 228. *Aphis prunorum* Fabr., cauda.
 Fig. 229. *Aphis prunorum* Fabr., third and fourth antennal segments.
 Fig. 230. *Aphis prunorum* Fabr., cornicle.
 Fig. 231. *Aphis pseudobrassicae* Davis, third and fourth antennal segments.
 Fig. 232. *Aphis ramona* Swain, antenna.
 Fig. 233. *Aphis ramona* Swain, front of head.
 Fig. 234. *Aphis ramona* Swain, cauda and anal plate.
 Fig. 235. *Aphis ramona* Swain, cornicle.
 Fig. 236. *Aphis euonomi* Fabr., cornicle.
 Fig. 237. *Aphis euonomi* Fabr., third and fourth antennal segments.
 Fig. 238. *Aphis salicicola* Thomas, cornicle.
 Fig. 239. *Aphis salicicola* Thomas, third and fourth antennal segments.
 Fig. 240. *Aphis sambucifoliae* Fitch, third and fourth antennal segments.
 Fig. 241. *Aphis senecio* Swain, cauda.
 Fig. 242. *Aphis senecio* Swain, cornicle.
 Fig. 243. *Aphis senecio* Swain, front of head.
 Fig. 244. *Aphis senecio* Swain, third and fourth antennal segments.
 Fig. 245. *Aphis senecio* Swain, fifth, sixth antennal segments, and spur.
 Fig. 246. *Aphis setariae* Thomas, cornicle.
 Fig. 247. *Aphis setariae* Thomas, third and fourth antennal segments.
 Fig. 248. *Aphis malifoliae* Fitch, cornicle.
 Fig. 250. *Aphis malifoliae* Fitch, fourth antennal segment.
 Fig. 251. *Liosomaphis berberidis* (Kalt.), front of head.
 Fig. 252. *Liosomaphis berberidis* (Kalt.), third and fourth antennal segments.
 Fig. 253. *Siphocoryne capreae* (Fabr.), third and fourth antennal segments.
 Fig. 254. *Siphocoryne capreae* (Fabr.), fifth and sixth antennal segments and spur.
 Fig. 255. *Siphocoryne capreae* (Fabr.), cauda and supra-caudal spine of alate females.
 Fig. 256. *Siphocoryne capreae* (Fabr.), cauda and supra-caudal spine of apterous females.
 Fig. 257. *Siphocoryne pastinacae* (Linn.), third and fourth antennal segments.
 Fig. 258. *Siphocoryne pastinacae* (Linn.), fifth and sixth antennal segments and spur.
 Fig. 259. *Siphocoryne pastinacae* (Linn.), cauda of apterous female.
 Fig. 260. *Siphocoryne pastinacae* (Linn.), cauda of alate female.
 Fig. 261. *Siphocoryne pastinacae* (Linn.), cornicle.

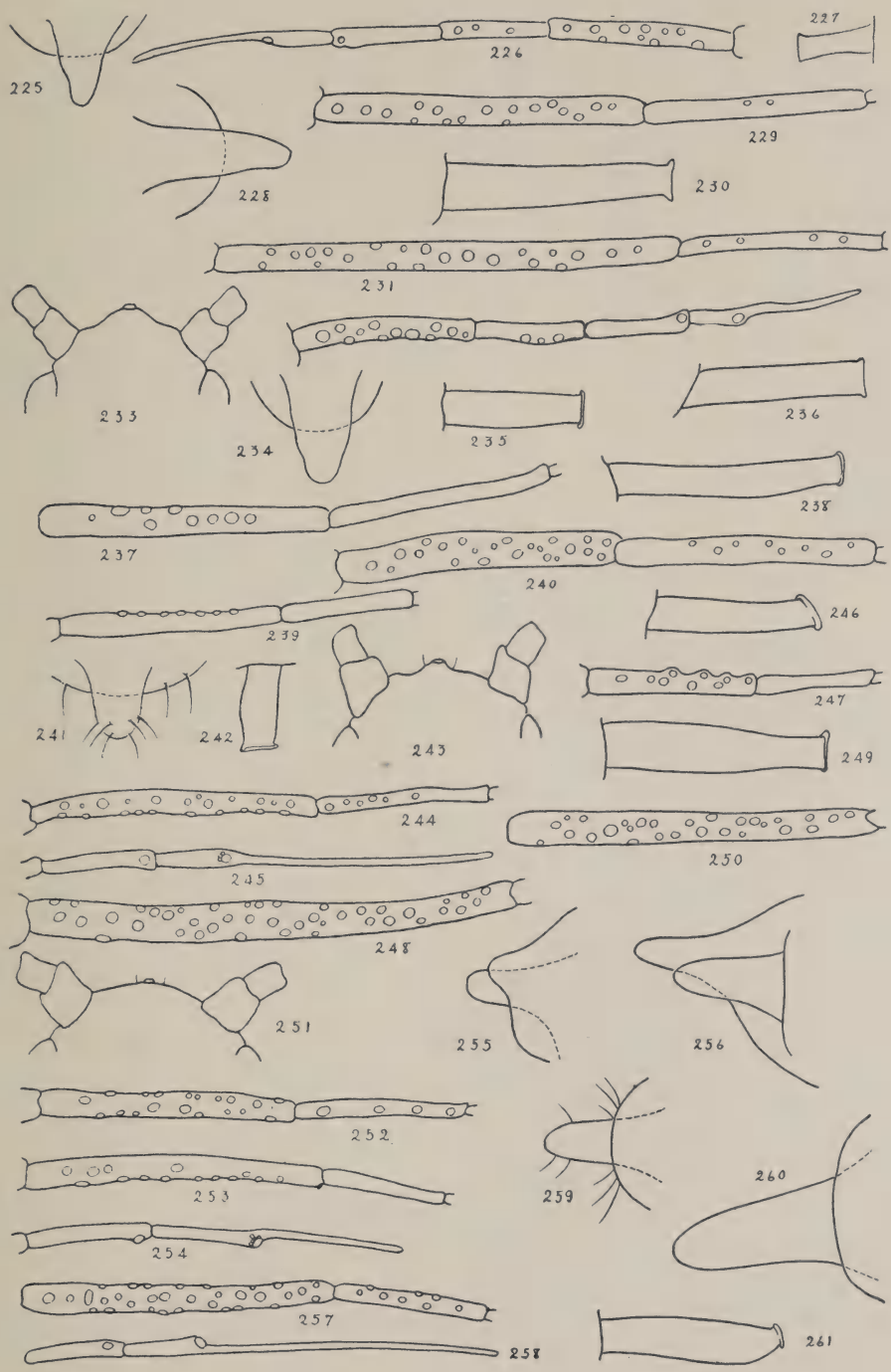
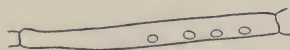


PLATE 12

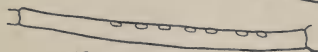
- Fig. 262. *Myzocallis discolor* (Monell), fore wing.
Fig. 263. *Myzocallis discolor* (Monell), third antennal segment.
Fig. 264. *Myzocallis bellus* (Walsh), fore wing.
Fig. 265. *Myzocallis bellus* (Walsh), third antennal segment.
Fig. 266. *Myzocallis californicus* Baker (*maureri* Swain), fore wing.
Fig. 267. *Myzocallis castanicola* Baker (*dauidsoni* Swain), fore wing.
Fig. 268. *Myzocallis arundinariae* Essig, third antennal segment.



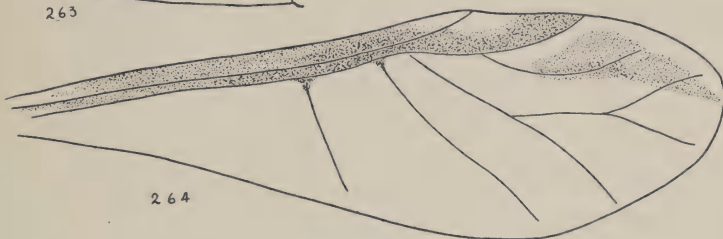
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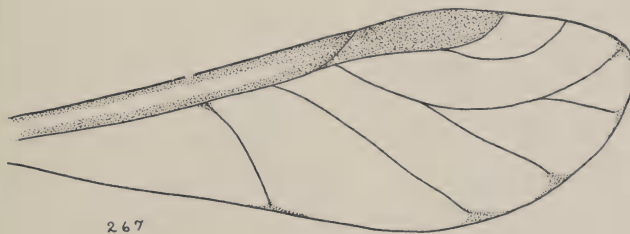
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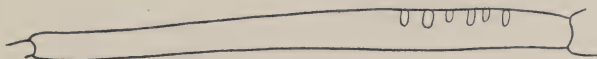
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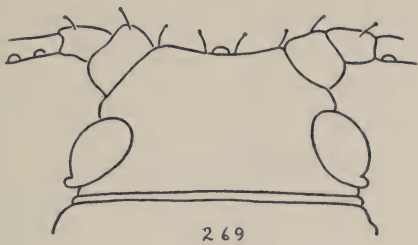
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PLATE 13

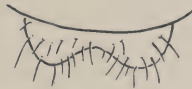
- Fig. 269. *Symydobius chrysolepis* Swain, head.
Fig. 270. *Symydobius chrysolepis* Swain, cornicle.
Fig. 271. *Symydobius chrysolepis* Swain, anal plate.
Fig. 272. *Symydobius chrysolepis* Swain, antenna.
Fig. 273. *Symydobius chrysolepis* Swain, fore wing.
Fig. 274. *Symydobius chrysolepis* Swain, hind wing.
Fig. 275. *Thomasia populicola* (Thomas), fore wing.



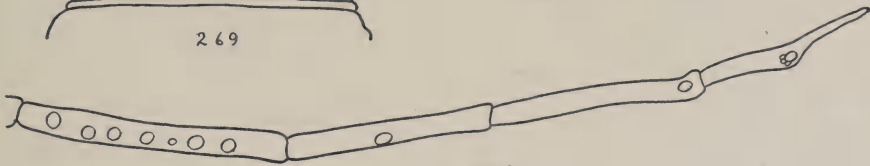
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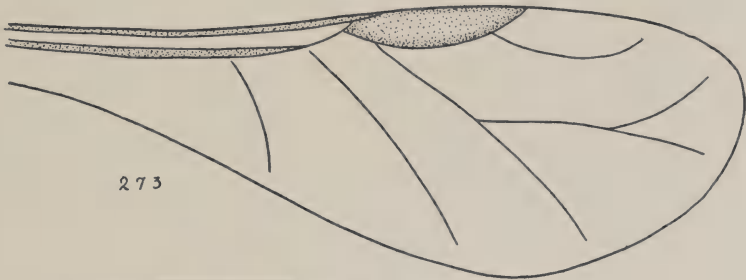
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PLATE 14

- Fig. 276. *Toxoptera aurantii* (Fonse.), fore wing.
Fig. 277. *Rhopalosiphum lactucae* (Kalt.) head.
Fig. 278. *Rhopalosiphum lactucae* (Kalt.), third antennal segment, aptera.
Fig. 279. *Rhopalosiphum lactucae* (Kalt.), third antennal segment, alate.
Fig. 280. *Rhopalosiphum lactucae* (Kalt.), fourth and fifth antennal segments, alate.
Fig. 281. *Rhopalosiphum lactucae* (Kalt.), sixth antennal segment, alate.
Fig. 282. *Rhopalosiphum lactucae* (Kalt.), cornicle, alate.
Fig. 283. *Rhopalosiphum lactucae* (Kalt.), cauda, alate.
Fig. 284. *Rhopalosiphum lactucae* (Kalt.), cornicle, aptera.
Fig. 284a. *Rhopalosiphum lactucae* (Kalt.), cauda, aptera.

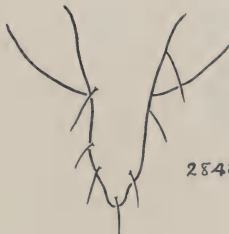
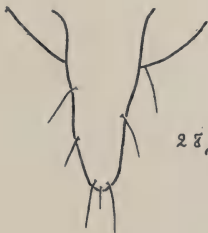
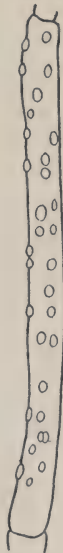
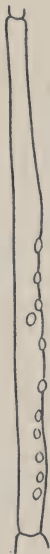
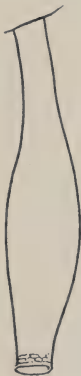
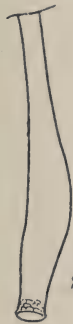
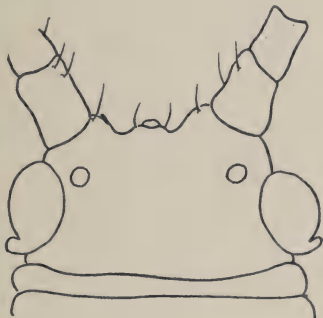


PLATE 15

- Fig. 285. *Aphis viburnicolens* n.sp., third antennal segment.
Fig. 286. *Aphis viburnicolens* n.sp., cornicle.
Fig. 287. *Aphis viburnicolens* n.sp., cauda.
Fig. 288. *Aphis cerasifoliae* (Fitch), head.
Fig. 289. *Aphis cerasifoliae* (Fitch), fifth and sixth antennal segments.
Fig. 290. *Aphis cerasifoliae* (Fitch), third and fourth antennal segments.
Fig. 291. *Aphis cerasifoliae* (Fitch), end of wing.
Fig. 292. *Aphis cerasifoliae* (Fitch), side of abdomen showing cauda, cornicle, and lateral tubercles on segments one, two, three, four, and seven.

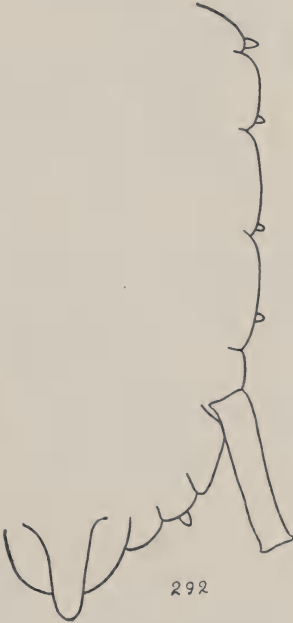
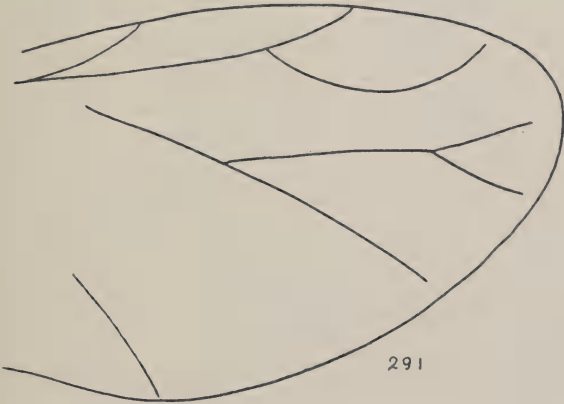
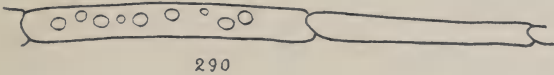
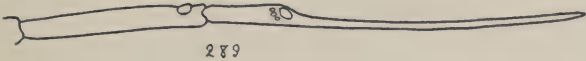
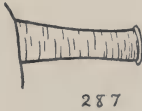
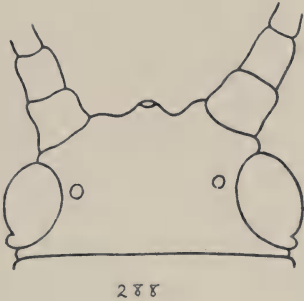
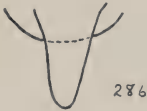
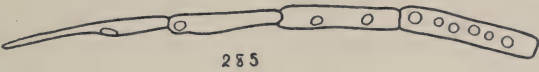


PLATE 16

- Fig. 293. *Aphis marutae* Oest., head.
Fig. 294. *Aphis marutae* Oest., third and fourth antennal segments.
Fig. 295. *Aphis marutae* Oest., fifth and sixth antennal segments.
Fig. 296. *Aphis marutae* Oest., antenna, aptera.
Fig. 297. *Aphis marutae* Oest., end of abdomen, aptera.
Fig. 298. *Aphis marutae* Oest., cauda, alate.
Fig. 299. *Aphis marutae* Oest., cornicle, alate.
Fig. 300. *Aphis neomexicana* Ckll., var. *pacifica* Dvdn., third and fourth antennal segments.
Fig. 301. *Aphis neomexicana* Ckll. var. *pacifica* Dvdn., cornicle.
Fig. 302. *Aphis neomexicana* Ckll. var. *pacifica* Dvdn., cauda.
Fig. 303. *Aphis yuccae* Cowen, fourth, fifth, and sixth antennal segments.
Fig. 304. *Aphis yuccae* Cowen, third antennal segment.
Fig. 305. *Aphis yuccae* Cowen, tip of abdomen.

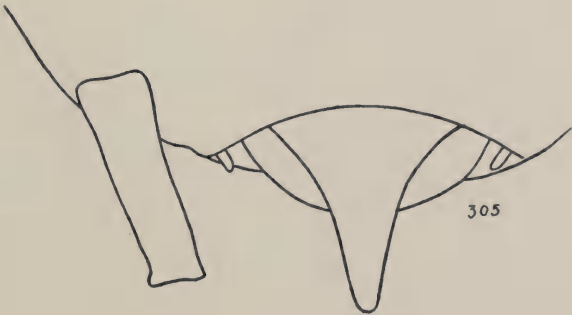
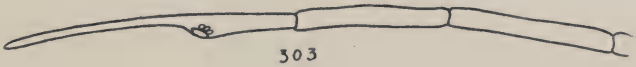
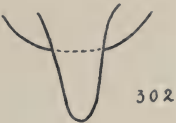
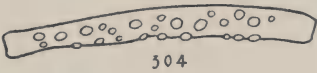
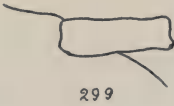
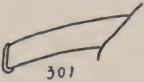
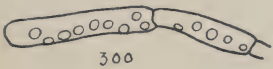
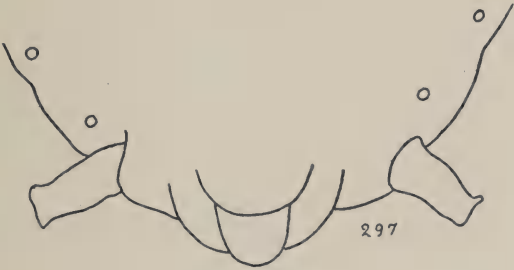
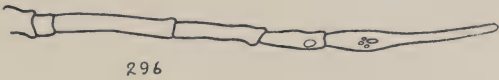
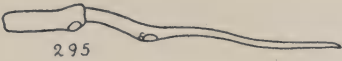
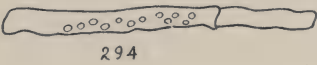
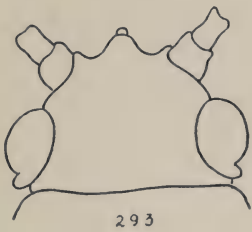
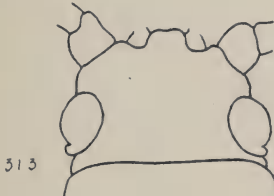
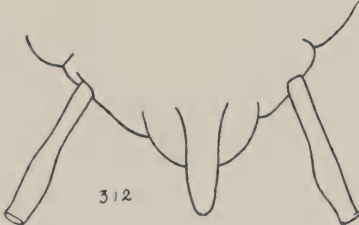
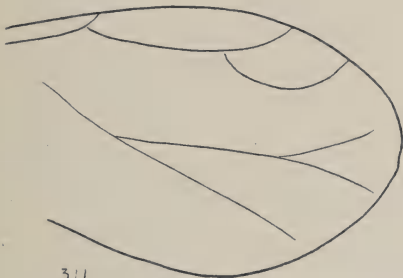
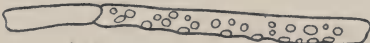
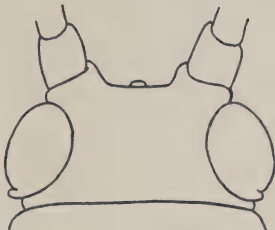
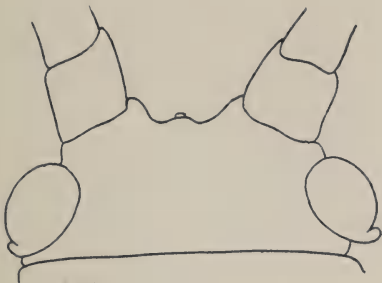


PLATE 17

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July 25, 1925

ON A
COLLECTION OF PSEUDOSCORPIONS
FROM THE STOMACH CONTENTS OF TOADS

BY

JOSEPH CONRAD CHAMBERLIN

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ON A COLLECTION OF PSEUDOSCORPIONS
FROM THE STOMACH CONTENTS
OF TOADS*

BY
JOSEPH CONRAD CHAMBERLIN

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Through the kindness of Dr. R. V. Chamberlin of the Museum of Comparative Zoology I have had the opportunity of examining an interesting collection of pseudoscorpions taken from the stomach contents of toads (*Bufo*) in various parts of the country. This collection was made by the U. S. Biological Survey at Washington in the course of their investigation on the food of toads.

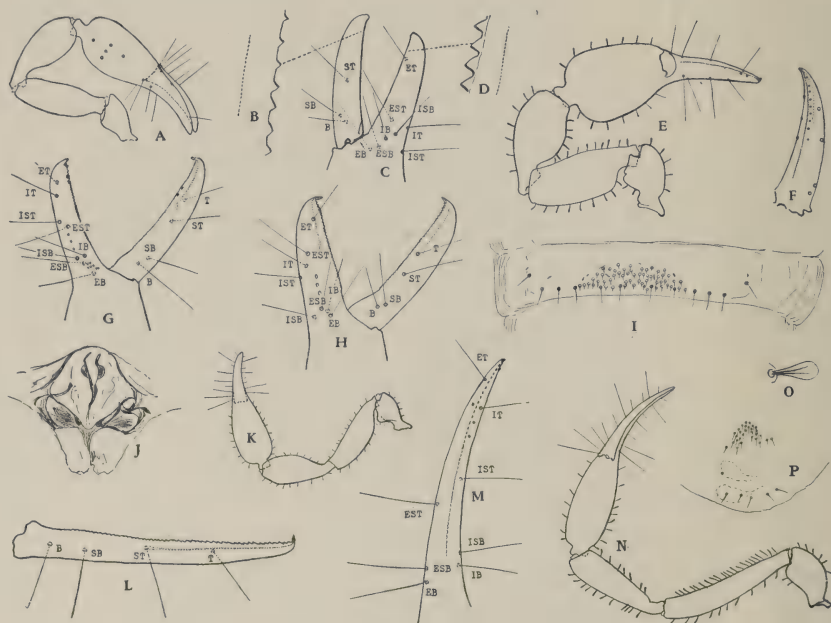
Hyarinus gen. nov.

Orthotype.—*Hyarinus hesperus* sp. nov. California.

Diagnosis.—Obisoid genus in which the fourth femoral articulation is strongly oblique; first femoral articulation perpendicular and of sub-immobile type, the pars basalis comprising more than a third the total length of the femur, although distinctly shorter than pars tibialis; poison duct presumably of short type and present in fixed finger only; flagellum of six slender, more or less pinnate blades; pleural membrane evenly plicate; T of movable finger apparently absent; cluster of 5 pseudotactile setae on dorsum of claw (fig. A); general chaetotaxy of claws as figured (fig. C); carapace rounded anteriorly and bearing two distinct pairs of eyes, anterior pair of which is about their own diameter from anterior margin, with second pair less than their own diameter from first pair; carapace and tergites undivided, smooth, and indistinctly tessellated; appendages smooth and almost polished; setae all completely simple; tergal and sternal setae weakly developed, apparently but 4 border setae to each tergite and sternite.

* Paper No. 123, University of California, Graduate School of Tropical Agriculture and Citrus Experiment Station, Riverside, California.

Remarks.—The affinities of this interesting genus are noted under the specific heading. So far as known the only species here referable at present is the orthotype.



Figures A-P

Hyarinus hesperus sp. nov. ♀. Holotype. A, Dorsal aspect of left palpus. The areoles for the insertion of the five "pseudotactile setae" of the hand only are shown, the setae themselves being broken. B, Marginal teeth from near tip of movable finger. C, Interior aspect of right claw showing the chaetotaxy. D, Marginal teeth from near tip of fixed finger.

Chernes peninsularis sp. nov. ♀. Holotype. E, Ventral aspect of right palpus. F, Dorsal (vertical) aspect of movable finger, showing poison duct and accessory teeth. G, Interior aspect of left claw, showing chaetotaxy, marginal and accessory teeth sense spots and poison duct.

Withius vagrans sp. nov. ♂. Holotype. H, Exterior aspect of right claw showing chaetotaxy, sense spots and poison ducts. I, Seventh ventrite showing chaetotaxy and median cluster of microsetae. J, General aspect of male genitalia (ventral aspect). K, Dorsal aspect of left palpus.

Zaona biserialum (Banks). ♀ JC-532.02001. L, Inner aspect of movable finger of left claw showing chaetotaxy and poison duct. M, Ventral (vertical) aspect of fixed finger of left claw showing chaetotaxy and marginal and accessory teeth. N, Ventral aspect of right palpus. O, Tergal seta. P, Vulva of female. Seminal receptacles indicated by dotted lines.

Hyarinus hesperus sp. nov.

Figures A, B, C, D

Holotype.—♀, JC—532.05001. "Identification card No. 822, Bufo #, Santa Barbara, California." The holotype and only known specimen is in very poor condition.

Diagnosis.—Palpus of form figured (fig. A); claw with chaetotaxy as figured (fig. C); marginal teeth of fixed finger of claw 33–35, small and conical in shape and slightly less than their own width apart (fig. D); movable finger with 30–32 evenly spaced, smaller conical teeth, their own width or more apart (fig. B).

Measurements.—No measurements of legs or accurate measurements of chelicerae obtainable. Total length, 2.7 mm. K, 0.65 mm. Carapace (1.28–0.74, 0.95). Chelicera (only approximate), (0.43–0.23, 0.31). Palpus (coxae unknown) (0.62–0.32) (1.00–0.35) (1.05–0.43) (1.75–0.58) (0.88–0.26).

Remarks.—This species is similar in several respects to the species described by Banks as "*Ideoroncus*" *obscurus*. They cannot well be confounded with one another, and both are widely separated from any other known species.

Bank's *obscurus* is no doubt generically distinct from *Hyarinus* and, likewise, is widely separated from true *Ideoroncus* by many fundamental morphological characters. Consequently a new genus is here erected for its reception.

Syarinus gen. nov.

Orthotype.—*Ideoroncus obscurus* Banks. Pacific Coast of United States of America.

Diagnosis.—Obisoid genus closely related to *Hyarinus*; structurally similar thereto except that no traces of eyes or eyespots are present; full complement of tactile setae of movable finger present, T being submedian and scarcely its diameter removed from ST; general chaetotaxy of claw distinctly different from that of *Hyarinus*; no indication of the five pseudotactile setae on dorsum of hand as is the case in *Hyarinus*; marginal teeth of fingers of claw clearly contiguous, and not spaced as in *Hyarinus*.

Remarks.—Other differences will no doubt be apparent as soon as good material of *Hyarinus* becomes available and a complete description can be written. The structure of the femora of the legs in these two genera renders confusion with any other known "Obisoids" impossible.

Syarinus obscurus (Banks)

1893. *Idcoroneus obscurus* Banks. Can. Entom., vol. 66.

Previously recorded from California and Washington. It has also been recorded from Montana but this record is open to serious doubt.

Material Examined.—Paratype from Olympia, Washington, ♀, JC—17.01002. "Pacific Coast," unknown locality, ♂, JC—18.02001 from the Museum of Comparative Zoology. Yolla Bolly Mountain, Mendocino County, California, ♀, JC—16.01001, collected on fur of *Microtus constrictus* by G. F. Ferris. San Gregoria Beach, San Mateo County, California, 7 or 8 females (JC—19.01001—7 or 8) from under bark of live oak (*Quercus agrifolia* Neé) log on beach, March 20, 1921, collected by Carl D. Duncan and the author. Berkeley, California, ♀, JC—32.02001, collected by Dietrich.

Remarks.—An undescribed species of this genus, closely related to *obscurus*, is at hand from Colorado. It is interesting to note that out of a rather large series of specimens of the two species, not a single male appears. It is also noteworthy that in both species the spinneret of the immature specimens is composed of a large, basally divided, compoundly ramose galea, while in the adult it is reduced to a small, simple, or slightly branched stylet.

Garypus californicus Banks

Material.—Three badly damaged females (JC—332.01001 —3). "Santa Barbara—California. Identification card No. 832 Bufo Δ." From the stomach of a toad, *Bufo* sp.

Chernes peninsularis sp. nov.

Figures E, F, G

Holotype.—♀, JC—532.04001. "Identification card No. 1149, *Bufo* Δ. Cape San Lucas, Lower California, Mexico." The fragmentary holotype (minus most of abdomen and legs) is the only known specimen.

Diagnosis.—Indistinct eyespots present; anterior carapacial furrow slightly nearer posterior than anterior margin; posterior furrow slightly nearer posterior border than anterior furrow; palpus as figured (fig. E); tactile setae and poison ducts as figured (figs. G, F); movable finger with 48 or 49 subconical, slightly retrorse, contiguous marginal teeth; with 2 exterior accessory teeth anterior to nodus ramosus, and 3 interior accessory teeth, the first of which is about even with the posterior tooth of exterior series, all subequally spaced; fixed finger with 47 similar marginal teeth; with 3 exterior accessory teeth even respectively with the 2d, 7th and 9th marginal teeth,

interiorly with 6 accessory teeth, subequally spaced, extending posteriorly almost half the length of the finger; fixed finger with 3 interior longitudinally spaced sense spots between IST and ISB; and 3 exterior similarly spaced sense spots lying between EST and ESB, as well as with a basal exterior group of 6 or 7 spots (fig. G); flagellum of 3 blades, the anteriormost of which is longest and anteriorly dentate; about 14 to 16 setae, 4 lyrifissures and 45-50 microlyrifissures per tergite; palpal setae rather short, stout, non-clavate, and distally slightly dentate; other setae lost; 18 teeth in serrula exterior, cheliceral setae lost.

Measurements.—Total length about 3 mm. K, —0.83 mm. Carapace (1.26-0.66, 1.13). Chelicera (0.42-0.21, 0.30). Palpus (0.65-0.42, 0.54-0.48) (0.66-0.39) (1.00-0.43) (0.99-0.47) (2.10-0.66) (0.90-0.26) Leg I (0.30-0.46, 0.43-0.50) (0.27-0.22) (0.30-0.24, 0.50-0.22) (0.57-0.15) (0.51-0.10). Leg IV (0.33-0.28, 0.42-0.30). (Remainder of leg lost.)

Remarks.—In spite of the mutilated condition of the only known specimen of this species, there is little doubt as to its being truly congeneric with *C. cimicoides* Fabr. of Europe, the genotype of *Chernes*. It is certainly not a *Hesperochernes*.

Zaona gen. nov.

Figures L, M, N, O, P

Orthotype.—*Chelifer biseriatus* Banks. Florida.

Diagnosis.—Related to *Chernes* and *Hesperochernes* from which it may be immediately distinguished by the very slender, non-pedicellate, *Chelifer*-like palpi (fig. N); flagellum of 3 blades as in *Chernes*; chaetotaxy of chelicera as in *Chernes*; chaetotaxy of claw as figured (figs. L, M); 3 or 4 accessory teeth on fixed finger only (fig. M); poison duct extending almost even with ST of movable finger (fig. L); interscutal and intersegmental membrane longitudinally wrinkled but scarcely rugose; pleural membrane slightly and rugosely wrinkled; carapace posteriorly as broad as long; with two distinct eyespots or perhaps weakly developed real eyes; both carapacial furrows distinct but not prominent; 12-14 tergal and sternal border setae per segment; tergal setae smoothly and broadly clavate (fig. O); sternal setae completely simple; palpal and pedal setae short and stout but not clavate; female genital area and seminal receptacles as in *Chernes* (fig. P).

Remarks.—The orthotype is the only species at present referable to this interesting and comparatively isolated genus.

***Zaona biseriatum* (Banks)**

Figures L, M, N, O, P

1895. *Chelifer biseriatum* Banks, Jour. N. Y. Entom. Soc., vol. 3.

Previous records.—The type locality is Lake Poinsett, Florida. Banks has also recorded it from Punta Gorda, Florida, and Berger from Berea, Ohio. This last record is very doubtful and probably incorrect.

Material Examined.—Two badly damaged females (JC—532.02001–2) from “Sebastian Florida, 2–11–19 A.W.” Presumably not from the stomach contents of toads, at least not so labeled. Through the courtesy of the authorities of the Museum of Comparative Zoology I have also had the opportunity of examining a series of Banks’ paratypes.

Remarks.—It was the slenderness of the palpi, no doubt, which led Banks to erroneously refer this species to *Chelifer* instead of “*Chelanops*.” The accompanying figures will permit positive specific determination.

***Withius vagrans* sp. nov.**

Figures H, I, J, K

Holotype.—♂, JC—532.03001. “Identification card No. 2314, Bufo ☉, Brownsville, Texas.” The holotype and only known specimen is in good condition.

Diagnosis.—Palpus as figured (fig. K); chaetotaxy and poison ducts of claw as illustrated (fig. H); with 2 true eyes; anterior carapacial furrow almost median, posterior furrow nearer posterior margin than anterior furrow; sides of carapace subparallel, beginning to converge just behind the eyes; tergal chaetotaxy 10:10:10; $\frac{0-2-0}{10}$, $\frac{2-2-2}{8}$, $\frac{2-2-2}{9}$, $\frac{2-2-2}{9}$, $\frac{2-2-2}{8}$, $\frac{2-1-2}{8}$, $\frac{2-2-2}{4}$; ventral chaetotaxy about as figured (fig. I); the median cluster of microsetae found on the 3d to 10th segments, although reduced in size and distinctness on 3d and 10th ventrites; last ventrite with many microlyrifissures; male genitalia as figured (fig. J); tergal seta short and broadly spatulate; ventral setae short, acuminate; palpal setae short and thick, not spatulate.

Measurements.—Total length, 2.15 mm. K, 0.58 mm. Carapace (1.21–0.52, 0.83). Chelicera (0.33–0.21, 0.28). Palpus (0.59–0.35, 0.47–0.42) (0.59–0.31) (1.00–0.31) (0.99–0.38) (1.46–0.45) (0.66–0.17). Leg I (0.31–0.40, 0.43–0.45) (0.23–0.24) (0.31–0.24, 0.75–0.31) (0.73–0.17) (0.54–0.10). Leg IV (0.10–0.24, 0.43–0.33) (0.21–0.19) (0.19–0.24, 0.44–0.23) (0.50–0.14) (0.45–0.08). Depth of claw 0.44.

Remarks.—It is possible that some of the “*Chelanops*” described from Texas and other southern states (for example *C. texanus* Banks), are really *Withiine* forms, in which case it is possible that this species will fall as a synonym of one of them. Until they are redescribed, however, no safe decision on this point can be rendered.

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